UNITED STATES NAVAL INSTITUTE PROCEEDINGS

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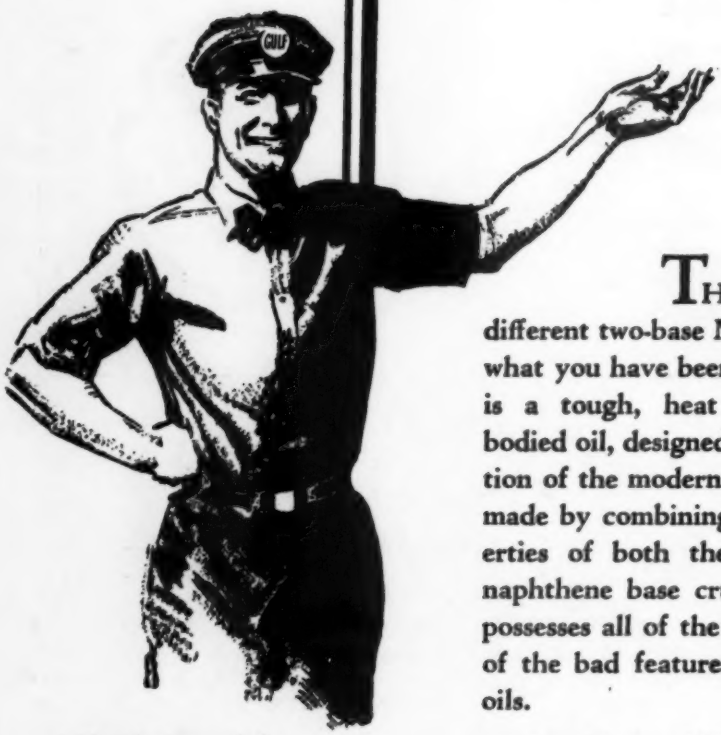

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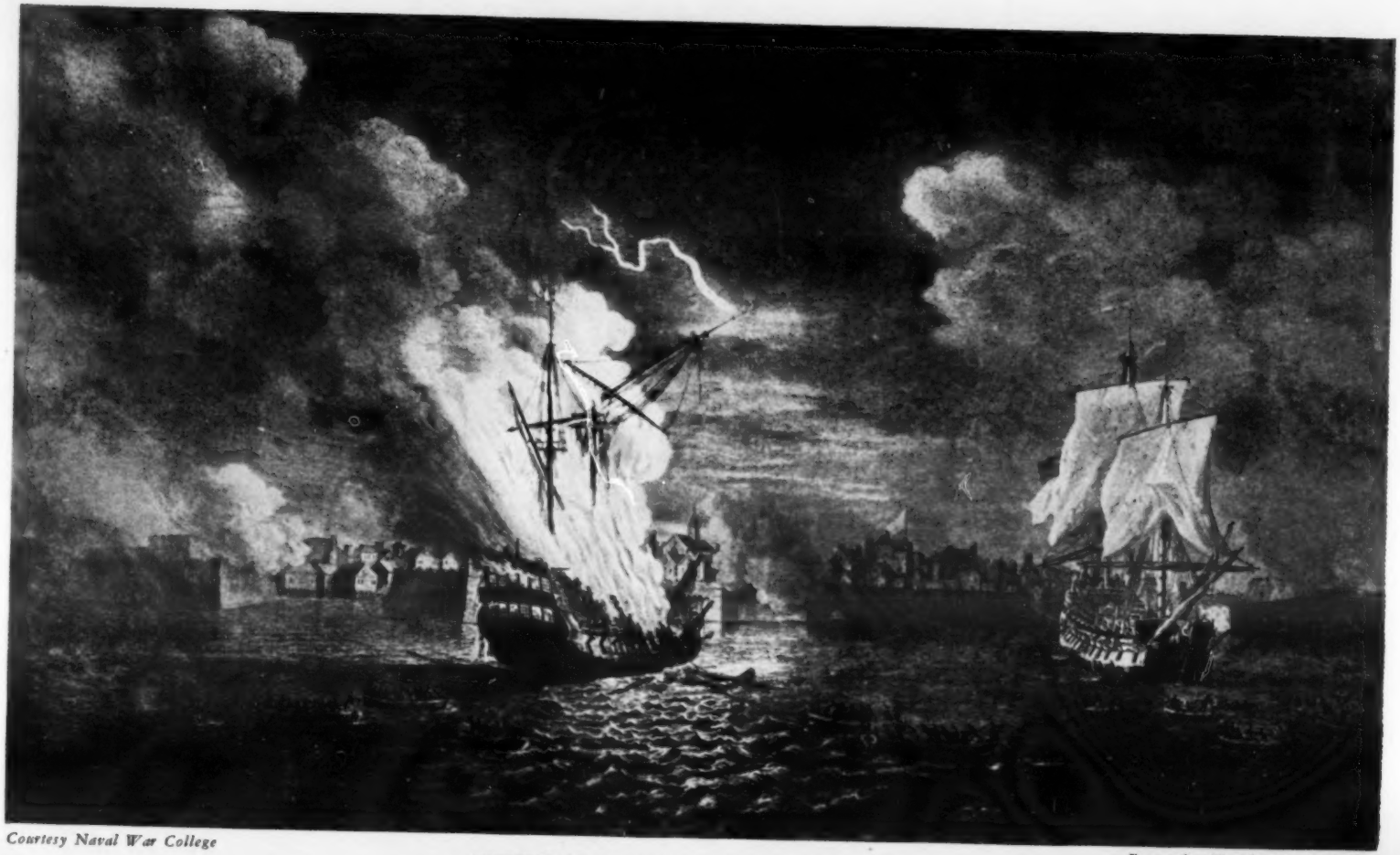

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BURNING OF THE *PRUDENT* AT LOUISBURG, 1758

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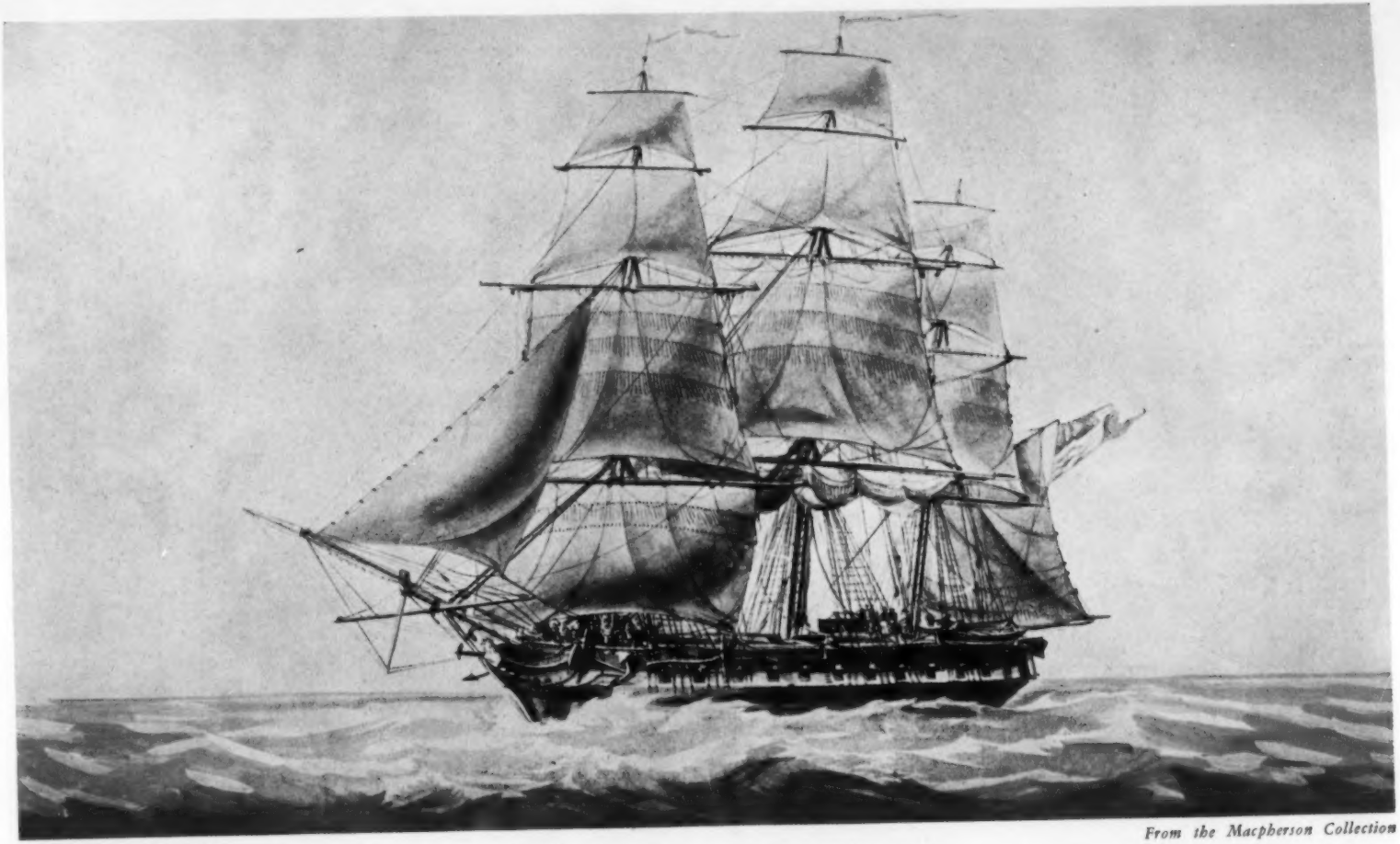

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AN AMERICAN SLOOP OF THE *HORNET* CLASS (1814)

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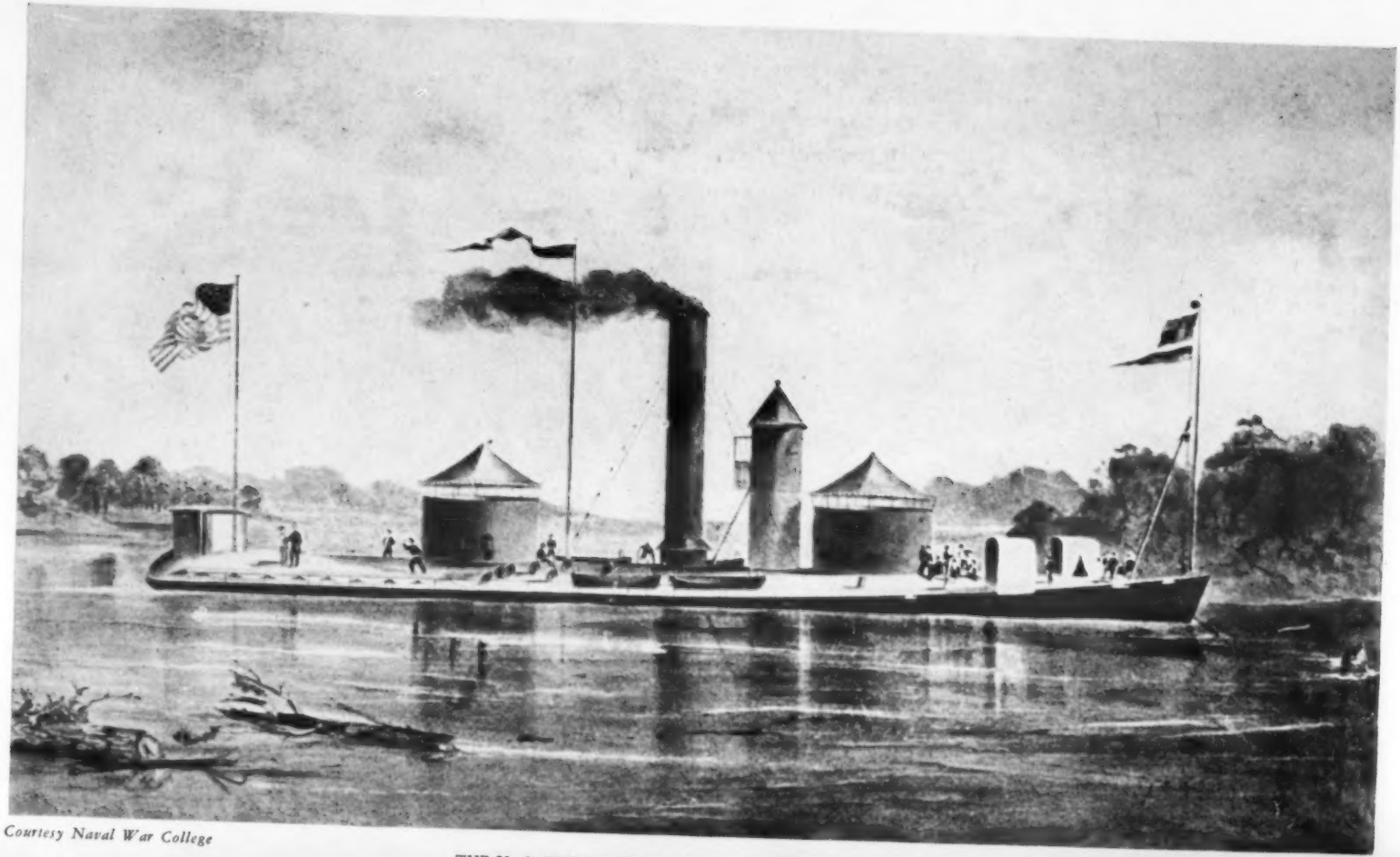

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THE U. S. IRONCLAD MONITOR *KICKAPOO*, BUILT 1863

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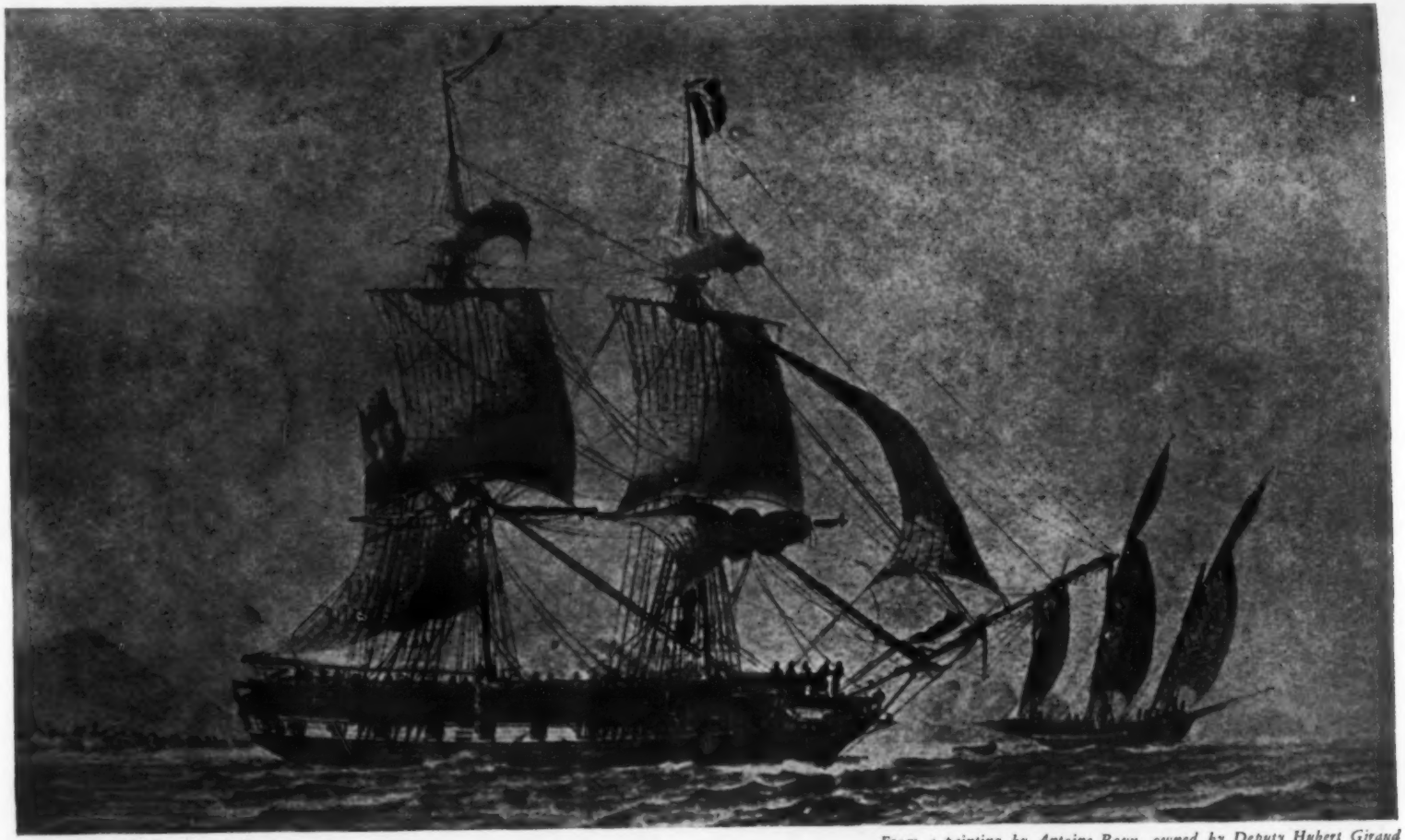

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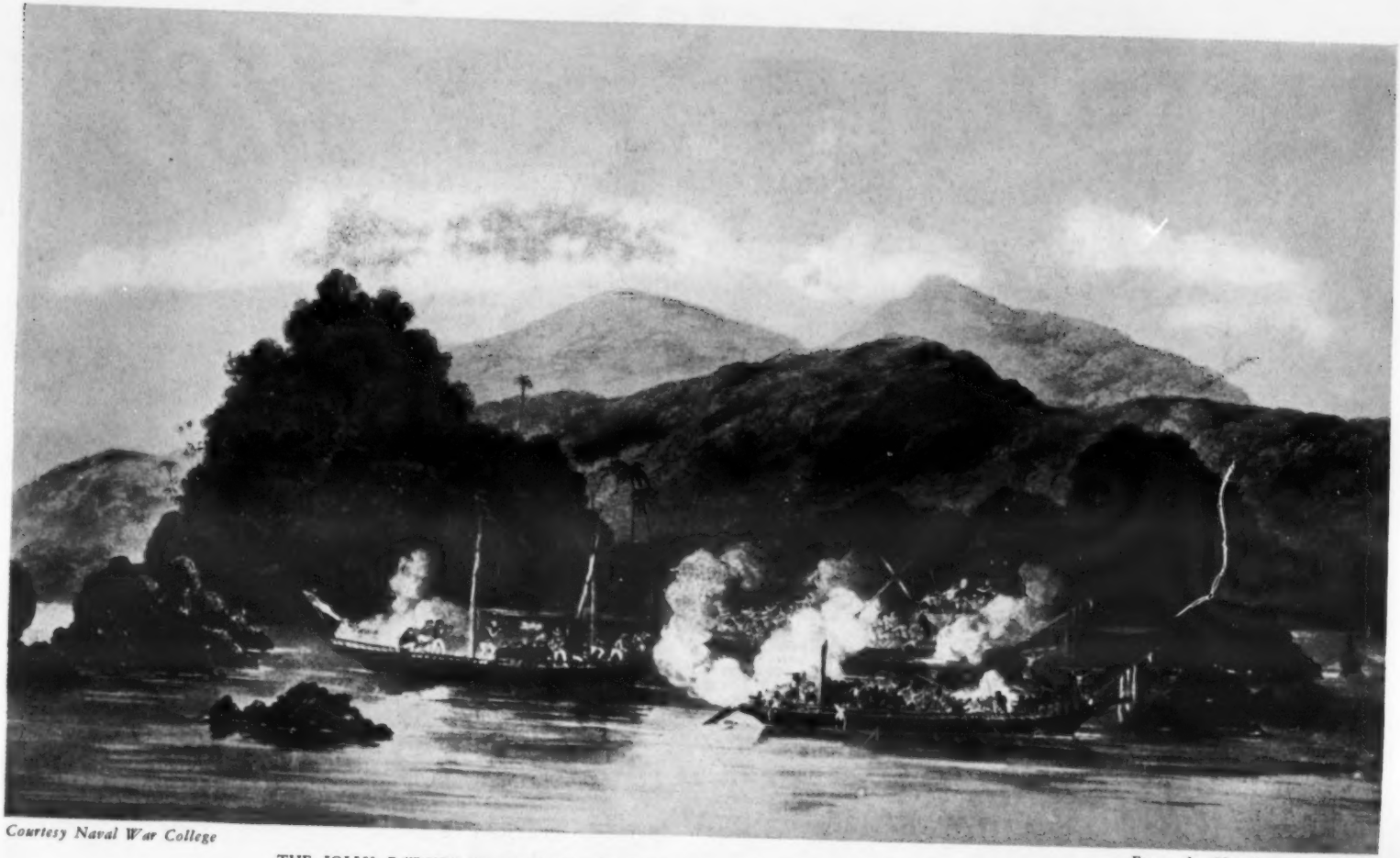
From a painting by Antoine Roux, owned by Deputy Hubert Giraud

SPANISH BRIG AND MARSEILLAISE PINQUE



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THE *JOLLY BATCHELOR* BEATING OFF TWO PIRATICAL PROAS AT DATTO POINT, BORNEO, MAY 21, 1843

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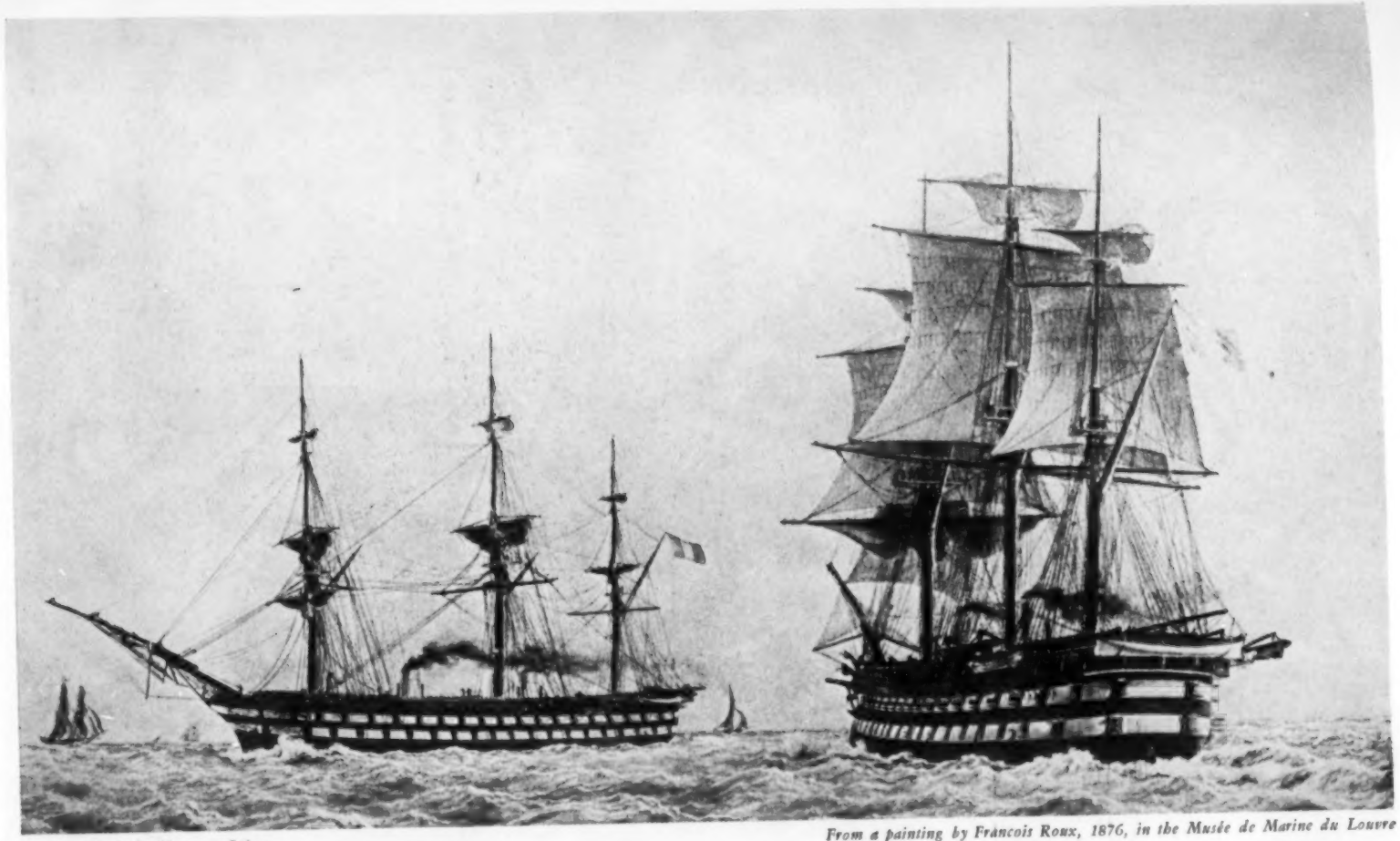
THE *JOLLY BATCHELOR* BEATING OFF TWO PIRATICAL PROAS AT DATTO POINT, BORNEO, MAY 21, 1843



Courtesy Peabody Museum, Salem

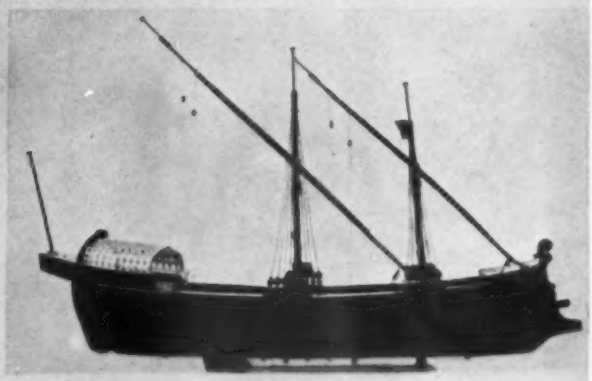
From a painting by Francois Roux, 1876, in the Musée de Marine du Louvre

FRENCH WARSHIP *LE NAPOLEON*, BUILT IN 1850, UNDER STEAM AND SAIL

(*Above*)

MODEL OF A ROMAN MERCHANT GALLEY,

made by Dr. J. Sottas, of Paris.



(*Below*)

MODEL OF BIREME,

of the type mentioned by Pliny, from the Naval Museum at Madrid.

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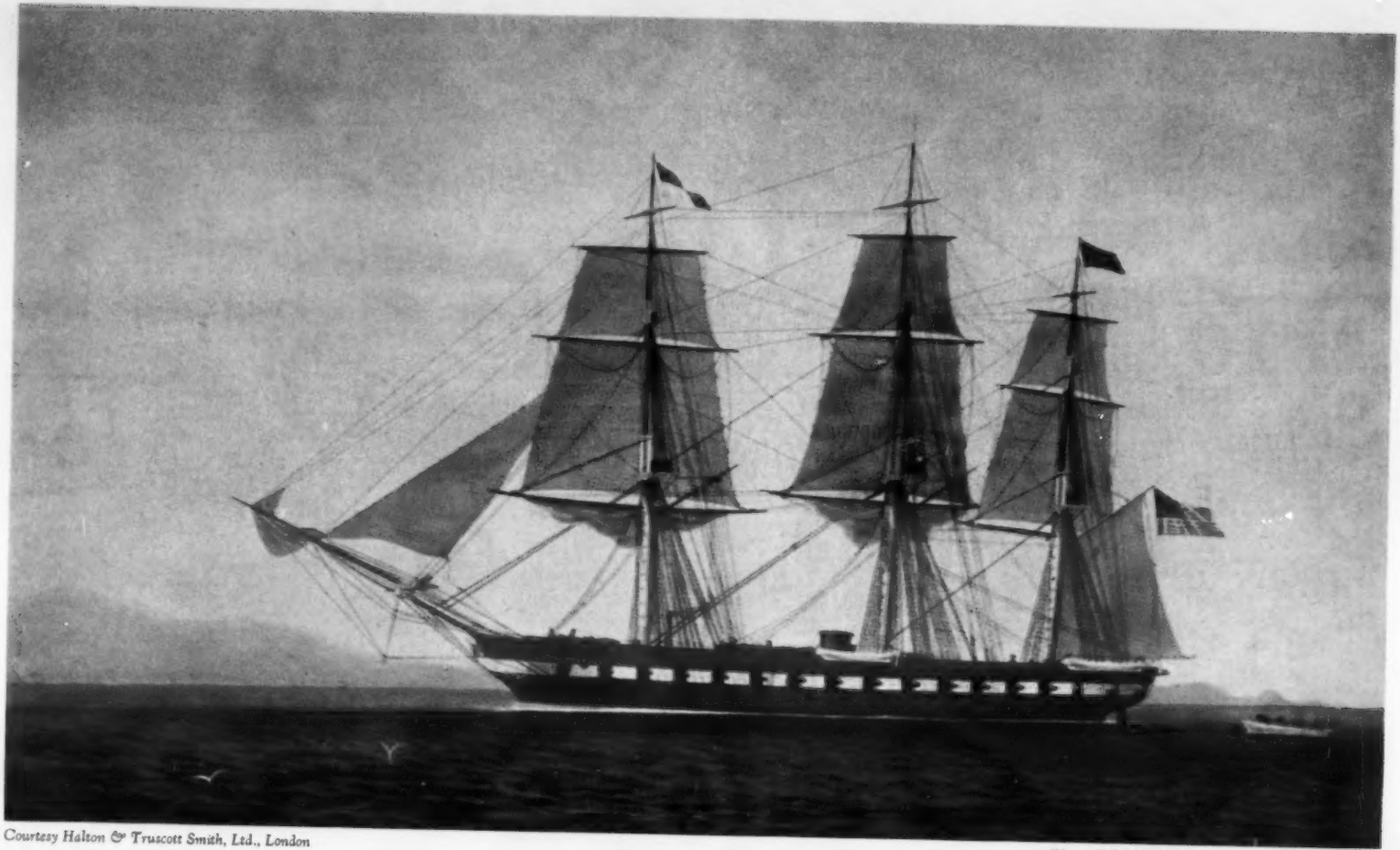

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UNITED STATES NAVAL INSTITUTE PROCEEDINGS

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PRIZE ESSAY 1931

ELEMENTS CONTRIBUTING TO AËRIAL SUPERIORITY

By Lieutenant Franklin G. Percival, U. S. Navy (Retired)

He (the seaman) will observe also that changes of tactics have not only taken place after changes in weapons, which necessarily is the case, but that the interval between such changes has been unduly long.—Mahan.

WE USUALLY think of aërial superiority almost entirely in terms of aircraft strength and are prone to forget that it is equally dependent upon antiaircraft strength. The tendency toward such thinking is a chronic peace-time failing. In the days before 1914, for example, we heard much of the potentialities of the submarine, but very little about the necessity for measures of defense against it. Thirty or forty years before that, the torpedo boat was hailed as the potential scourge of the seas; yet it took just about one generation to evolve the obvious counter, the light cruiser, and to produce battleships which were adequately protected against the underwater menace.

Then, too, it is human nature to think chiefly of whatever is most obvious. The spectacular tactics of aircraft render them inevitably the cynosure of all eyes. Planes in peace-time maneuvers, furthermore, can act out more realistically than surface vessels their probable battle performance. This is always impressive to the eye and therefore to the mind. When we see a flight of light bombers, motors thundering and wires screaming, diving out of the sun or some low-hanging cloud straight at our battle line, we can easily visualize the damage which they might do to our ships.

Unfortunately for our sense of proportion, we see the battleships make no reply, and in peace time it is impossible for them to do so. They simply steam on in apparent helplessness. If we could see them actually shooting down plane after plane, it would forcibly remind us that there are two sides to the question and furnish us an impressive demonstration of the importance of the development of antiaircraft strength. We cannot present such a spectacle as an aid to the restoration of a balanced viewpoint and as a stimulant to thought, but we can frankly acknowledge this unfortunate tendency and take drastic steps to remedy it.

This matter of antiaircraft strength, however, goes far beyond a mere problem in gunnery; it involves ship design, strategy, and tactics. It is useless to develop antiaircraft guns, fire-control instruments, and modern ship designs, unless our ideas on strategy and tactics are equally abreast of the times. This slowness in changing tactics to meet new conditions is what Mahan inveighs against in our opening quotation.

It is unsafe to assume that current ideas are in tune with the existing situation. His-

tory shows us too many instances to the contrary; for example, Churchill reports that, when he became First Lord of the Admiralty in 1911, the British war plans were based on the principle of a close blockade of the German coast. It now seems almost incredible that expert opinion could have gone so far astray. Let us not spend too much time, however, in contemplating the mote that was in the strategical eye of our British brothers, but rather let us investigate to see if there is not a beam in our own strategical and tactical eye.

This paper therefore deals chiefly with the neglected subject of antiaircraft strength, dwelling upon the reasons for its importance and offering suggestions leading to its further development, not only in the field of weapons and instruments, but also in the realm of strategy and tactics. Although we have no idea of attempting to belittle the necessity for developing aircraft strength, it has been so thoroughly discussed by others that only one phase remains which we could examine profitably here. Since this phase is of special current interest, it is next taken up.

Aircraft Strength

If we exclude matter relating purely to aviation, such as the design, procurement, upkeep, and tactical employment of aircraft, training of personnel, and improvements in equipment, our problem becomes one of how to get the maximum number of planes to the scene of action. One solution which has been advocated is that we should equip every type of warship with all the airplanes that it can possibly carry. Our contention, however, is that, with the exception of carriers, we should equip surface vessels with only such aircraft as are needed for the service of the individual ship. Spotting planes, for example, are an integral part of the fire-control organization of a battleship or cruiser and, as such, should be carried aboard the given vessel. We maintain that planes carried for the sole purpose of adding to the air strength of the fleet as a whole should be placed aboard either our regular carriers or merchant vessels with improvised flying decks.

All classes of warships are now limited as to their maximum individual tonnage and as to the total tonnage of each class which may be built. The designers of the various navies are therefore competing to produce the maximum fighting strength on the given displacement in each category. The addition of airplanes or other weapons which do not directly add to the fighting strength of the given type must then be avoided, especially when the planes can better be carried aboard merchant vessels which are limited neither in tonnage nor in number. Would it not be almost as unwise to build a combination battleship and aircraft carrier as to build a combination battleship and fleet repair ship?

Are we not compelled to admit that the ever-growing number and complexity of weapons necessitates a corresponding multiplicity of specialized warships with resulting interdependence between the various types? The march of progress everywhere has replaced the Jack-of-all-trades by the specialist and the general tool by the specially adapted tool. Is there any reason for assuming that navies are an exception to such a universal law? We know how, in the competition for the world's markets, a primitively organized country like Turkey goes down before a highly industrialized country like Germany. Will not a fleet, which refuses to recognize the necessity for specialization, go down similarly before a fleet which does recognize that necessity?

In discussing the basic principles of ship design, Mahan writes as follows:

> Confusion of thought and consequent confusion of object, is fatal to any conception, at least to any military conception; it is absolutely opposed to concentration, for it implies duality of object.

Again he writes:

> In the design of the individual ship of war . . . exclusiveness of purpose . . . is the secret of great military successes.

If we agree with Mahan as to the necessity for exclusiveness of purpose, it follows that we should redouble our efforts to develop our merchant marine in order to have the necessary raw material for converted aircraft carriers, mine layers, transports, and auxiliaries, as well as to carry on vital commerce in time of war. Our people need to be taught that it is a patriotic duty to patronize American shipping. It would also be a great help if the enthusiastic proponents of aviation could be made to see aërial

strength and surface strength as complementary and interdependent, not as antagonistic and irreconcilable.

Before we drop the subject of building up our aircraft strength there is one possibility held out by the London treaty which deserves investigation. That treaty makes the following provision:

> The fitting of a landing-on or flying-off platform or deck on a capital ship, cruiser, or destroyer, provided such vessel was not designed or adapted exclusively as an aircraft carrier, shall not cause any vessel so fitted to be charged to or classified in the category of aircraft carriers. . . .
>
> Not more than 25 per cent of the allowed total tonnage in the cruiser category may be fitted with a landing-on platform or deck for aircraft.

These hybrid cruisers will be discussed in the following section.

Flying Deck Cruisers

In any discussion of a new type we must avoid an error commonly made, the assumption that a cruiser which carries twenty airplanes is better than one which carries two, or that a cruiser which makes thirty-five knots is better than one which makes twenty-five knots. Such may or may not be the case; it all depends upon what other qualities have been sacrificed to obtain the given superiority and upon what the cruiser is to be used for, which, in turn, depends upon what functions must be executed and upon what other vessels are available.

The operations of this type of cruiser may be divided into three classes. The first of these is an engagement with opposing forces beyond gun range, when only the planes could be employed. For this purpose, a converted merchant vessel of suitable type and an all-gun cruiser should be a more effective combination. The liner could carry more planes and would not suffer from interference between antiaircraft gunfire and flying operations, as would be the case aboard the hybrid cruiser. The all-gun cruiser, furthermore, could mount a much more powerful antiaircraft battery than could a hybrid cruiser. Thus the combination would represent both greater aircraft strength and greater antiaircraft strength than the proposed hybrid.

The second class of operations is gun fighting with other surface vessels. Here, the presence of the airplanes with the inevitable quantities of gasoline would add greatly to the fire hazard in the hybrid cruiser. The flying deck would probably not last long in a gun engagement, while the large hangar would use up valuable displacement and center-line space, block the effective arc of fire of the guns, and add to the size of the target. If the cruiser is to use its guns effectively, the course it steers will be dictated by the necessities of the gun action. This course will rarely permit flying operations. Even if it did and the flying deck were still intact, such operations would be greatly hampered by gun blast, flying splinters, and wreckage, as well as by the general incident confusion. In other words, in a gun action, the flying deck and planes would constitute a hindrance as well as a hazard, and would use up tonnage needed for guns, armor, or ammunition. On the contrary, the all-gun cruiser would suffer from none of these disabilities; while its consort, the auxiliary carrier, could remain out of the gun fight and proceed uninterruptedly with flying operations.

This might suggest that, during a battle, we use these hybrid cruisers as carriers primarily, with the further idea that their powerful batteries would serve, not only to protect themselves against hostile aircraft, but also to protect our less well-defended, improvised aircraft carriers. For this third class of operations, it will be seen that, if these hybrid cruisers devote themselves chiefly to flying operations, the protection they would afford the improvised carriers would probably be of a desultory and ineffective nature. In any case it would be much less than could be afforded by an all-gun cruiser.

We conclude, therefore, that while a 10,000-ton out-and-out aircraft carrier would be worth building and a 10,000-ton out-and-out cruiser would be worth building, the tactical employment and material requirements of the two types differ so fundamentally that a hybrid type would be a failure for gun fighting; while, for flying operations, a converted merchant vessel and an all-gun cruiser would be a more effective combination. We do not mean to say that a hybrid cruiser would be of *no* value, but that it would not be of so much value as either of the other types. Furthermore, as will be shown in a later section, the element now most needed to balance the fleet is anti-

aircraft strength. For this, we need the all-gun cruiser.

Whether or not it should eventually be desirable to build some of these hybrid cruisers, one must concede that it is now unwise to use our precious available balance of cruiser tonnage to build types designed primarily to add to the aircraft strength of the fleet, when we still have a large unexpended balance of carrier tonnage; when we can get far more aircraft strength per ton in a larger out-and-out carrier; when we can get aircraft strength without any expenditure of combatant tonnage by utilizing suitable merchant vessels; when we possess no adequate defense for the carriers we already have; and when we desperately need our remaining cruiser tonnage to provide such a defense, as well as to execute certain other functions of the all-gun cruiser.

There is, however, a specialized function for which the hybrid cruiser should be invaluable; that is to serve as the fleet flagship. This vessel operates behind a surface screen and is therefore subject ordinarily to attacks only by aircraft, but probably by many of them. It has little use, consequently, for an 8-inch battery but must have an unusually strong antiaircraft battery of 6-inch and smaller guns. A flying deck and several planes are also necessary in order to provide the necessary facilities for observation by members of the staff. Since twenty or thirty planes are probably more than sufficient, the relatively small plane capacity of the hybrid cruiser is no handicap; on the contrary, the powerful antiaircraft battery made possible by the reduced airplane capacity is exactly what we need. This is not the place to go into a discussion of the various characteristics most desirable for such a vessel. It is mentioned only because it would be unfair to sweepingly condemn the hybrid cruisers for general cruiser functions without calling attention to the fact that this type is ideal for a fleet flagship.

Antiaircraft Strength

Aside from the factors previously mentioned, there has been an unfortunate trend of thought which has hampered the development of antiaircraft strength. It is the tendency to regard this development as a purely passive measure of defense. The contention of this paper, however, is that antiaircraft strength is required, not only to enable our surface forces to execute their missions with a minimum of interference from hostile aircraft, but also to enable our fleet air force to be employed more effectively. It does the latter by freeing our planes from defensive duties for which they are not suited and enabling them to concentrate on offensive operations for which they are admirably suited, and to continue such operations by making secure their mobile base, the carriers. This contention can be clarified by taking up some concrete examples.

Suppose, in the first case, that our fleet is in mid-ocean facing a fleet of equal strength both in surface craft and aircraft, but that our fleet has an adequate gun defense against aircraft while the opposing fleet has only a weak gun defense of the type now found in the various navies. During the approach, we have the option of launching or withholding our aërial attack. If we allow the enemy to attack first, our adequate gun defense will not only repel the attack, but also destroy a large percentage of the planes and shake, if not shatter, the morale of the opposing air force. Then, when our attack is launched, it will encounter no resistance in the air worth mentioning, the gun defense of the enemy fleet will not do much damage, and there will be really nothing serious to prevent the total disablement of the hostile carriers before the surface fleets are in contact. We would then have undisputed command of the air with results which need not be dwelt upon.

Suppose again that we launch our attack first and deliver it while the hostile planes are aboard the carriers. The opposing gun defense would not stop our planes and the first big attack under such circumstances would, to say the least, disable the carriers enough to prevent further flying operations. Again, command of the air would be gained at slight cost.

Or suppose that both air attacks are launched simultaneously. Since the mission of both air forces would be offensive rather than defensive, they would probably continue to their objectives, even though they sighted each other en route. In the event of a clash between the air forces, however, our air force would have the advantage, because it would not have been compelled to leave any fighting planes behind to protect the fleet. We could have, consequently, more offensive planes and just as many defensive

planes or vice versa. When the opposing air forces reach their objectives, the enemy air force will be met with a withering blast of flying steel and will be repulsed, while our air force will encounter no serious resistance unless all enemy fighters happened to be in the air at the time. Even in that case, it is doubtful if the defense would be effective. Extensive maneuvers over London a few years ago indicated that the airplane is a poor defense against other planes.

Let us take another case in which again the surface fleets and air forces are equal, but in which neither side has an effective gun defense against aircraft. Since an adequate defense cannot be supplied by planes alone, it follows that the side which launches its attack first will gain a decisive advantage. This is leaving things too much to chance. That this is the existing state of affairs in our fleet, is indicated by the maneuvers off Panama for the past two winters. In both cases, the side which first launched its attack, was successful for the simple reason that there existed no adequate defense for either carrier. Under these conditions, if the attacks were launched simultaneously, there would simply be an orgy of mutual destruction with no result. This would appeal only to those minds who judge a battle, not by the results achieved, but by the size of the butcher's bill.

We then may say that, in the judgment of expert and experienced officers, the question of aërial superiority would be decided largely by chance if our fleet encountered another fleet which was similarly lacking in antiaircraft strength. It also follows that, if our present fleet were to encounter a fleet which had built up an adequate gun defense, we would promptly and inevitably be driven out of the air. Can we afford to tolerate longer such a situation?

The enormous potentialities of the airplane are conceded by even the most conservative among us. The question no longer is whether it is or is not an effective weapon, but whether we will or will not take the necessary measures to meet this indubitable menace. In fact, the case may be stated even more strongly. No doubt, we must eventually face the situation squarely and meet it fully. The question really is whether we will meet it now or whether we will wait until it is perhaps too late.

We do not have to hark back into ancient history to find a somewhat parallel situation. In 1914, the submarine had developed into a formidable weapon and Sir Percy Scott began making some very sensational claims as to its future. The conservatives of the Royal Navy launched furious attacks upon these claims, but did nothing whatever to prepare means of combatting the submarine in case war should break out. As things turned out, the submarine did constitute the most serious threat which the British had faced since the days of Napoleon. If the conservatives had used the same amount of energy in devising means of countering the submarine that they did in attacking Sir Percy Scott, the British Empire would have been much better off.

The point which they did not realize was that when a new weapon is developed, it pays not only to push the development of that weapon, but also to push with equal energy and enthusiasm the development of an adequate defense against it. Whenever a new weapon appears, either we must conquer it, or it will conquer us. Once conquered, it becomes a useful servant. Until conquered, it simply paralyzes our fleet, so far as offensive operations are concerned.

We all can remember how the submarine came to dominate the whole situation in 1917. Had the entente powers been ready in 1914 with the various counter measures which they finally adopted, the course of the naval war would have been very different. The under-sea weapon would promptly have been forced into its proper minor rôle instead of becoming the whole show.

The story of the torpedo, the mine, the rifled gun, and all new weapons, shows the same lag between the development of the weapon and of the counter thereto. We do not mean to say that nothing has been done to meet the aërial menace. On the contrary, much progress has been made, probably as much as has been made in any navy. What we do mean to say is that the development of antiaircraft strength has lagged notably behind the development of aircraft strength. Can we not profit from history and push the development of the former with the same vigor and resources that we have used in pushing the latter?

It requires no great stretch of the imagination to foresee that, if war were to break out tomorrow, the battle fleets of the great powers would be paralyzed by the air-

plane, so far as offensive operations are concerned, just as the Grand Fleet was paralyzed by the submarine and the mine. Are we to allow our magnificent fleet to be hamstrung by this lack of antiaircraft strength? Then, is not the development of the maximum antiaircraft strength in the minimum time a problem which we can no longer afford to dally with? Toward its solution, the following section is aimed.

The Problem

On the one hand, the great weakness of the airplane is its vulnerability, the ease with which it can be shot down by even a small gun, once that gun finds its target. Although, in the closing days of the war, planes began to be armored, it is manifestly impracticable to give them protection against the guns carried by surface vessels. This vulnerability then must be put down as an irremediable weakness.

On the other hand, the great asset of the airplane is its mobility, its great speed and its freedom to maneuver in the vertical as well as the horizontal plane. This extreme mobility makes it hard to hit, gives it a wide choice of objectives, and enables it to concentrate superior forces against the comparatively fixed surface units, unless the latter are already concentrated. This mobility, furthermore, will steadily increase.

Our problem then may be stated in general terms as follows: how can we exploit to the fullest possible degree the weakness of the airplane, its vulnerability? And how can we neutralize most effectively the plane's great asset, its mobility?

In regard to the former, we propose to take the fullest advantage of the plane's vulnerability by mounting, so far as practicable, every gun on every ship so that it can be used as an antiaircraft gun, by pushing the development of every possible means of improving their accuracy and rate of fire, by developing special guns which are particularly suited to engaging aircraft, and by adopting tactical dispositions which will permit the maximum concentration of antiaircraft fire against planes approaching from any direction and at any level.

When it comes to neutralizing the mobility of the airplane, it is well to remember that all previous large-scale operations of aircraft have been against land forces which labor under several handicaps not imposed upon sea forces. To begin with, the enormous area covered by a modern army demands that its antiaircraft batteries be widely dispersed. Not only are the various batteries usually out of supporting distance of each other, but also the isolated battery is hopelessly weak in comparison with the forces against which it is supposed to afford defense. The remarkable mobility of the airplane thus enables the commander of the hostile air force to choose any one of many widely separated objectives and to bring an overwhelming concentration of force to bear upon the selected point of attack.

When an air force commander is dealing with a fleet, however, he has a vastly more difficult problem. In the first place, the fleet can be kept concentrated so that he has no choice of widely separated objectives, but must come to the fleet. His ability to effect concentrations is offset by the fact that the fleet is already concentrated. Thus he loses two of the great advantages of his mobility, if we keep our fleet concentrated.

The one remaining advantage of the airplane which we must neutralize is that its high mobility makes it hard to hit. This offers no insuperable difficulties. It will be conceded that, in high visibility when there is a reasonable amount of time to get on the target, it is simply a matter of improving the accuracy and rate of our gunfire and of firing simultaneously enough shells to render untenable a sufficiently large section of the atmosphere to offset probable maneuvers by the plane while the shells are in flight as well as the inevitable slight inaccuracies in gunnery. It is when the ceiling is low and planes can come diving unexpectedly out of the sun or near-by clouds that we will have trouble in disabling them before they land their attack.

According to a London dispatch in the New York *Herald Tribune* of September 21, 1930, the British Navy has already solved this problem. Extracts from this dispatch follow:

> The new weapon is a multiple machine gun of considerable size with an extremely rapid rate of fire, and furthermore has projectiles large enough to stop any planes which fly. . . .
>
> Experts here do not assert that the new gun will be able to engage planes flying at altitudes of 5,000 to 15,000 feet, which still must be left to larger guns, but they do believe that the new gun, discharging a comparatively small projectile, in which all of its many barrels are fired simultane-

ously, will act much the same say as a shotgun used to drive away marauding birds. . . .

There are two types of the aërial machine guns, one having eight barrels, the other four. . . .

Naval gunnery experts, however, are now satisfied they have produced a weapon which meets all requirements.

This is just the sort of weapon which we want. The problem is similar to shooting ducks and can be met in the same way. The obvious answer is a multiple machine gun with divergent barrels which will give the effect of a huge automatic shotgun.

We might even carry this one step further by equipping our vessels with sound-locating gear for detecting the approach of planes before they become visible. Once we have developed satisfactory multiple mounts, and sound-locating gear which is efficient regardless of ship noises, the menace of the diving bomber, the low-flying attack plane, and the torpedo plane, is ended.

The foregoing, however, by no means completes our list of ordnance requirements. We need a new 6-inch gun and mount for use against either surface craft or aircraft. We need new turrets, both 8- and 16-inch, so designed that when occasion demands, the guns can be used against aircraft. The necessary fire-control instruments constitute another major problem. The aërial menace can be met, but meeting it necessitates a period of the most intensive development of material that the Navy has ever known.

Airmen may laugh at the desultory antiaircraft fire which they encountered in France, but they will not laugh at the antiaircraft fire which we can and must develop in our fleet. A closely concentrated fleet represents a cohesive mass of destructive power such as is never grouped in a similar area in land warfare. If the total destructive potentialities of that fleet are so organized that they all can be turned against aircraft, the result will be a veritable tornado of flying steel through which no possible concentration of hostile planes could penetrate in condition to deliver an effective attack. Since it is possible to design a fleet which can do this; since antiaircraft strength is vital to aërial superiority; and since aërial superiority is a prerequisite to victory, why not go after this problem in earnest?

The Defensive Use of Aircraft

The reader may object that the defensive use of our own aircraft has been ignored. This has been done for several reasons. One is that it requires some time for fighting planes to take off, gain the necessary altitude, and get in formation. Due to the swiftness with which an aërial attack materializes, we could not count on having sufficient warning to get our fighters ready. We therefore must have a defensive patrol of fighting planes in the air at all times after we learn that the hostile air force is within striking distance. This defensive patrol necessarily would constitute only a fraction of our total number of defensive planes. Since the enemy air force could bring practically its entire strength to bear at a selected moment, it is manifest that this defensive patrol would fail to defend the fleet and would itself be annihilated by overwhelmingly superior forces. Another reason is that the enemy could, by dilatory tactics, so exhaust our pilots that they would be worn out before the first attack was launched. It is also apparent that the utilization of our planes defensively would seriously hamper the development of our antiaircraft fire, due to the difficulty of distinguishing friend from foe in a mêlee or, even when this could be done, of hitting the foe while avoiding the friend. The final reason is that experience has shown that the plane is a failure as a defensive weapon; that it is primarily an offensive weapon and can be utilized most effectively as such.

Our proposed system of gun defense, however, has the following advantages: The guns are always ready to provide the necessary protection. If we build up an adequate gun defense for the fleet, we can use all our planes offensively. Another advantage is that when our surface vessels shoot down the attacking planes, they are not only defending themselves and their own carriers but also they are whittling down the opposing air strength and disrupting enemy morale; best of all, they are doing this without any attrition of our own air force. In other words, we are conserving both our surface and our air strength while destroying enemy air strength. Finally, an adequate gun defense permits us to deliver or withhold our air attack as we see fit. In other words it gives us the initiative in the air.

The great Moltke was one of those who saw clearly the folly of invariably committing one's self to a headlong offensive. He believed that, when it was possible to take

a strong defensive position in which his opponent would be compelled to attack him, it was better to do so and allow the enemy to wear himself out in fruitless assaults. Then Moltke would take the offensive against the weakened antagonist who was now incapable of effective resistance. Our point here is that, by building up our strong gun defense against aircraft, we can start off with either the offensive or the defensive as may seem best, instead of being compelled to launch an immediate attack as our only hope of gaining aërial superiority.

Even Foch, that ardent and unwavering advocate of the offensive under any and all conditions, advised a certain discretion. He wrote:

> The art of war does not consist for the highest officers and for the commanders of an advance guard in falling upon the enemy like a wild boar. . . .
>
> A constant preoccupation, while we prepare and combine an action against the enemy, must be to escape his will, to parry any undertaking by which he might prevent our action from succeeding. Any military idea, any scheme, any plan, must therefore be connected with the conception of *security*. We must, as if we were fencing, attack without uncovering ourselves, parry without ceasing to threaten the adversary. . . .

This does not mean that war can be made without running risks, but it does mean that we should do everything possible to insure that an enemy will not be able to wrest the initiative from our hands.

An article by Lieutenant Ramsey in the PROCEEDINGS for August, 1930, discusses possible offensive operations. It is of particular interest in that he largely ignores the use of antiaircraft fire and depends almost entirely upon our own airplanes for defense against airplanes. One cannot read this article without being struck by the utter impracticability of an offensive under such conditions, even though the aggressive fleet possesses a vast superiority in surface strength. Lieutenant Ramsey, for example, gives only two hours for reaching a decision in the main engagement between the surface fleets, after which the offensive fleet must withdraw due to the exhaustion of the fuel supplies of its fighting planes. The history of previous naval battles indicates that much more time would be required for attaining decisive results. He, furthermore, fails to discuss what would probably happen to the aggressive fleet after its means of defense had been compelled to leave the air, or before it took the air, if that fleet had no adequate gun defense.

An important point here is that the security of the fleet which has an adequate gun defense against aircraft is largely independent of the relative strength of the opposing air force. Such a fleet, moreover, has the advantage that it can launch its own planes against the hostile carriers without worrying over its own safety, even though the hostile air force may have just been reënforced by shore-based aircraft. It is therefore apparent that building up the antiaircraft strength of the fleet is of even greater consequence, so far as ability to take the offensive is concerned, than is building up the aircraft strength of the fleet. We are not attempting to minimize the urgency of the latter, but merely to call attention to the importance of the neglected subject of antiaircraft strength and especially to the fact that it is vital to the effective employment, not only of our surface forces, but also of our aërial forces.

It was asserted previously that two of the great advantages which the airplane owes to its mobility could be neutralized by keeping our fleet concentrated. It is easier to assent to this self-evident assertion than to realize its far-reaching implications. Since space does not permit going deeply into these implications, we must content ourselves with calling attention to two of the most obvious. This will be done by means of concrete illustrations in the following section.

THE NEED FOR CONCENTRATION

Suppose that we have two fleets of equal strength in mid-ocean; that one of the fleets is closely concentrated; and that the other has a loose formation with a strategical scouting line of cruisers several hundred miles ahead of the main body. These cruisers are using planes for supplementary scouting and the carriers of the hostile main body are also using planes for scouting. Although it is likely that the scouting planes operating from the carriers will be larger, better equipped, and of longer cruising radius; let us give the cruisers the benefit of the doubt and assume that their planes make contact with the hostile main body at the same time that the scouting planes from the carriers discover the nearest cruiser of the scouting line.

The latter will be out of supporting distance from its own carriers, while the air force commander of the concentrated fleet can bring to bear as many bombers and torpedo planes as he wishes. It is simply a matter of how many he considers necessary to do the job most effectively. That cruiser must inevitably fall a victim to overwhelmingly superior forces.

The logical conclusion, furthermore, will be that the cruiser is part of a scouting group. If the others have not already been located, hunting for them will be immediately started. Even though all cruisers retreat at full speed on hearing of the first contact, it is likely that at least the nearest two will be similarly annihilated, and it is possible that the entire line will be wiped out. The result would be the same, regardless of whether that scouting line were composed of cruisers of the *Omaha* type, the *Pensacola* type, or the much-discussed hybrid type.

A cruiser carries from 400 to 600 highly trained men, takes three years to build, and costs from $10,000,000 to $20,000,000. The loss of even one such vessel would be a stiff price to pay for the single report. It would be trying, furthermore, to order a search when it was known that the cruiser making the contact and probably one or two cruisers on each side of it would not have a fighting chance unless the contact was made at nightfall. They could, of course, bring down some planes; but history shows that, whenever an overwhelming superiority of force can be brought to bear, the objective is attained with slight loss.

It is also worth noting that no speed which can be given a surface vessel would enable it to run away from an aërial attack. In other words, high speed is no longer a defense for the scout cruiser. We used to think it sound policy to build ships either to fight or to run. It is now useless to think of building them to run; we can build them only to fight. They can avoid fighting overwhelmingly superior forces, not by high speed, but by proper tactical dispositions. In short, the fleet must be kept closely concentrated when within striking distance of large hostile air forces.

There is no escaping the conclusion that, except in low visibility, surface vessels of all types whatsoever are now unsuitable for scouting. We must employ new material and make an entirely new approach to this highly important subject. We must find some way of producing submarines capable of a sustained surface speed of twenty knots and of carrying at least one small seaplane. We must have scouting planes of greater speed, cruising radius, seaworthiness and reliability, both amphibians operating from carriers and flying boats operating from tenders. We must effect improvements in aërial navigation which will permit the elimination of isolated reference vessels. We must have large airships carrying planes for supplementary scouting. We must further develop the employment of submarine listening gear for low-visibility scouting by surface craft. Finally we must have a new book on security and information.

If we carry our hypothetical case one step further to the air phase of a battle, we see again that this matter of keeping the fleet concentrated is of crucial importance. Suppose that the fleet which believes in concentration has its aircraft carriers with the main body and that main body in such a formation that planes attempting to attack the carriers will be exposed to the antiaircraft fire of the whole fleet. Suppose also that the opposing fleet has its carriers fifty miles or more in the rear of the main body, and part of its light forces spread out in a screen ten or fifteen miles from the battleships.

As the fleets approach, scouts from both sides will report the opposing dispositions. The concentrated fleet has the option of launching its planes against the main body and of retreating until the planes have returned and are ready to be launched against the carriers, or of waiting until the opposing carriers are in bombing range. If the concentrated fleet so chooses, it can bring to bear overwhelming concentrations of force upon the isolated and comparatively weak units of the opposing screen. Under such circumstances, severe damage could be inflicted on the light forces at slight risk to the attacking planes.

Whether the attack on the carriers is made first or after this attack on the light forces, the carriers of the dispersed fleet will be defended by only their own guns, while the carriers of the concentrated fleet will be defended by the antiaircraft fire of the entire fleet. Under these circumstances, the isolated carriers will inevitably be disabled,

or destroyed, while the well-defended carriers will suffer little if at all.

Imagine the situation which will then exist. The dispersed fleet will have been driven out of the air; its light forces will have been badly mauled; while probably bombers and torpedo planes already will be attacking its battleships. On the other hand, the concentrated fleet will be practically intact. All this is simply the logical result of modern tactical dispositions by one fleet and obsolete tactical dispositions by the other.

The reader may object that too much has been based on hypothetical cases. One can assert the result in each case with confidence because the consequences of ignoring the definitely established principles of war are always disastrous, if one is facing a capable opponent. It was one of Napoleon's axioms that an army should always be in a position to put forth the whole resistance of which it is capable. The same thing, of course, applies to a fleet.

Before the advent of aircraft, it was possible for a fleet to be dispersed over a comparatively wide area, provided that the outlying ships had enough speed to avoid more powerful hostile units and to rejoin before the enemy could attack in force. The development of powerful air forces at sea means that there is now no time for the surface units to concentrate before an attack can be delivered by the incomparably swifter aërial forces. It also means that any desired concentration of force from the entire air strength down to one plane, can be brought to bear on any isolated unit of the fleet. The inevitable consequence is that a fleet must concentrate before entering the area in which it is exposed to attack by air forces, and must remain concentrated until it leaves that area. Otherwise it cannot put forth its maximum powers of resistance against aërial onslaughts, and it leaves the isolated units exposed to concentrated air attacks which they never could survive.

Since our fleet does not now have the necessary types to carry on satisfactorily the service of information and security with all surface vessels concentrated, it follows that the production in the shortest possible time of the necessary auxiliary types is a matter of the utmost urgency.

Development of Material

The list of urgent material developments is almost staggering. We must have satisfactory multiple mounts for machine guns and small automatic guns; we must have sound locating gear and submarine listening gear which is efficient in spite of ship noises; we must have a new 6-inch gun and mount as well as new 8- and 16-inch turrets, all equipped for use against either surface craft or aircraft; we must have the accompanying fire-control instruments; we must have satisfactory airship engines of American manufacture; we must have airships carrying planes for supplementary scouting; we must have better airplane engines and more reliable aërial navigation; and finally we must have improved submarines with greatly improved Diesel engines. These developments are not merely desirable, they are absolutely mandatory if the fleet is to be able to do more than cower in some secluded base. The magnitude of the task is appalling, even when one considers the enormous resources of the Navy Department.

Does not the gravity of the situation warrant further modifications in our methods of development? It is significant that of the foregoing list of necessities, the two which show the greatest promise of fulfillment, better airplane engines and rigid airships carrying planes, are the results of private initiative with government aid. The excellent airship designs were obtained by offering a substantial cash prize. This was the way in which Tirpitz developed the remarkable engines for his submarines and, incidentally, paved the way for the still more remarkable engines of the *Ersatz-Preussen*. Even if we spent $10,000,000 or $15,000,000 in the next few years for cash prizes, history indicates that we could not spend a similar sum in any other way which would yield us such a rich harvest of improvements.

The promise of contracts and the commercial possibilities of the product have been sufficient incentives to produce gratifying results in many cases. In this way, we have obtained excellent airplane engines, planes, fire-control instruments, and machine guns. This method, of course, is suitable only where existing industries are capable of supplying our wants.

There will still be plenty for the Navy to do, if it turns all possible material development over to private enterprise. The new 8- and 16-inch turrets, for example, offer problems which can be solved only by the Navy. The mere framing of the require-

ments for the other material, the testing of the manufacturer's product, and the elimination of faults therein, constitute a huge task. Then some current ideas on tactics, and possibly on strategy and war plans, will need a thorough overhauling. It is safe to say that the necessary changes and the production of the enormous amount of greatly improved material could not be handled within a reasonable time by the Navy Department alone without a great expansion in personnel and facilities.

Has not the time come for us to frankly admit that the variegated duties of a naval officer do not permit him to acquire the highly specialized knowledge necessary for the production of the complicated material now required? He knows what is wanted and can state the requirements. When he does this and turns the problems over to commercial concerns, the results are very gratifying. Here is a method which works, whenever and wherever it has been tried. Why not utilize it to the fullest possible extent?

Summary

1. There is a tendency to think of aërial superiority almost entirely in terms of aircraft strength and to ignore the equally important element of antiaircraft strength.

2. Aircraft strength should be augmented by building up to the treaty limits of carrier tonnage and by developing our merchant marine, rather than by building hybrid types or by overloading existing gun vessels with airplanes.

3. A fleet lacking in antiaircraft strength will inevitably be driven out of the air by a fleet of equal strength which has developed an adequate gun defense against aircraft. If two fleets equally lacking in antiaircraft strength should meet, the result would be decided by chance. A fleet lacking in antiaircraft strength cannot take the offensive against even a much weaker fleet. The building up of our antiaircraft strength is therefore vital to our security.

4. Antiaircraft strength may be augmented by the development of suitable weapons, instruments, types of ships, and tactics.

5. Except for building a fleet flagship and possibly a relief flagship, we should utilize our unexpended balance of cruiser tonnage for types calculated to add to the antiaircraft strength of the fleet rather than to its aircraft strength.

6. Our Navy is not prepared to meet the situation which would confront it if war should break out tomorrow, in that individual ships and the fleet as a whole are lacking in antiaircraft strength; in that some current tactical ideas need modernization; and in that we lack the greatly improved types of aircraft, submarines, and listening devices needed for the service of information and security.

7. The production in the shortest possible time of the enormous amount of material required, is a vital problem. Turning those problems over to commercial concerns, offering either cash prizes or substantial contracts as incentives, has produced consistently excellent results. The Navy Department will have all that it can do in solving those problems which cannot be solved elsewhere. The way out of our difficulty lies, therefore, in the maximum utilization of private enterprise and individual genius.

USING THE RUDDER WITH PERSONNEL

By Lieutenant Harry A. Rochester, U. S. Navy

THE crews of our ships need guidance to reach the channel of efficiency as well as ships need rudders to control heading and course. Take away your helmsman and the ship falls off to the wind and sea, floundering to no purpose. This paper points out some observations made as executive officer of a destroyer, and with limiting reservations may be applied to any group of men. As the title suggests, no attempt is made to present an abstract treatise on leadership, but practical hints are given for keeping the enlisted man clear of the menacing rocks and shoals.

Set the pace. Plan ahead, direct, correct, advise. Give simple direct orders. If instructions issued from higher authority have many-syllabled words, translate them into language that is understood by the man on deck and the man on the fireroom floor plates. Repeat your orders as often as necessary, so that there is no misunderstanding. Don't have a hazy idea of what your are trying to accomplish, and expect those under you to bring your uncrystallized ideas to completion. For instance, the ship will arrive the next morning in Yokohama, Balboa, or San Diego. Without the slightest plan or thought, the morning orders are written up in slack language as follows:

0600 All hands.
0630 Turn to. Make preparations for mooring.
All hands in undress blues.
0730 Breakfast.
Port routine.

At 0715, the mooring lines are laid out on deck for running and the cane fender is in place. The ship is just getting pointed for the approach. The captain finds the whaleboat not completely rigged in, only half the crew in proper uniform, and the starboard anchor not housed on deck. Fireworks. The executive officer and the officer of the deck cuss the chief boatswain's mate. After much confusion and flying off the handle, the ship moors twenty minutes late. Everyone from the division commander to the radio striker at the jackstaff is in bad humor. All hands are hot, bothered, and discontented because of the lack of a proper set of morning orders.

On another ship, just having moored previously, all is calm. Before the evening eight o'clock reports of the day before, all available information was obtained of expected movements the next morning. This information and the plans for the morning orders were given out at eight o'clock reports. The morning orders were then written up:

0530 All hands.
0550 Turn to. Get both anchors ready for letting go.
Break out mooring lines and cane fender, starboard side to.
Swing out motor whaleboat and dory for lowering.
Rig in lifeboat.
Down clothesline.
House starboard anchor on deck.
0650 All hands in uniform of day, undress blues.
0715 Expect moor.
0730 Breakfast.
0800 Quarters for muster.

At quarters any further word is passed about ship's work or liberty, which could not be obtained before.

It will be noticed that in the second set of orders, "All hands" is set thirty minutes earlier. There is thirty minutes less sleep, but all preparations move along without undue haste. The captain comes on the bridge, officers and men salute with an enthusiastic "good morning, captain." There is enough time available so that a few minor hitches in the program can be straightened out. The gunner's gang get in a few last licks on the brightwork, the fireroom gang are nursing the steam gauges, the boatswain's mate's gang are split up in groups about the ship. Everything moves quietly, smoothly. No friction, no sulking. Now the people on deck shift into the uniform of the day, and still there is a few minutes leeway left. A seaman reflects the equable mood of the ship in his philosophizing; "Gee, I hope the naval con'france would knock off talking about battlewagons, and would do somethin' about raising the pay of a second-class seaman."

Work must be planned ahead so that it will be done at a normal pace as much as possible. Don't make omissions and then expect someone else to supply the deficiencies.

Make positive inducements for a good record. Announce at quarters that the ship's policy is to rate up men within the ship whenever possible. Make announcements of men rated. They are led to feel you have confidence in them. Nothing succeeds like success.

Whenever anything is done for the men's comfort or contentment let them know about it in an impersonal way. Let them know why they can't be paid on time. The psychological time to pass the word for favorable announcements is when the men are grouped together as at meal times. If at 1135, a signal is received about special liberty, hold up the word until after piping to dinner, and the food has started disappearing.

Keep the men informed of the scheduled movements of the ship. Let them know as much in advance as possible the plans for drills, uniform, and other items with which they are directly concerned. Diffuse as much information as possible so that in their off moments they discuss these matters among themselves, and so further the interests of the ship.

A small ship does not offer much opportunity for recreation on a long cruise. Plan a comprehensive drill schedule. Then stir up means to keep the men's minds off themselves, and in a healthy state to foster the ship's mission. Initiate an acey ducey tournament, and in the finals oppose the champion of the deck force and the champion of the engineer's force for the ship's championship. The latter can carry a few dollars from the ship service as a prize. Keep bulletins posted of distance made good each day, and distance to port of destination. Post a small-scale chart with notes of prominent historical events that have taken place in the vicinity. This idea is as old as the Navy, but it applies as much as ever. On a recent cruise, three men came to request mast asking to have such a small-scale chart as a souvenir.

Before leaving a port for a long cruise, forestall pierhead leaps on the day of sailing. The last few days or hours before sailing, some men discover that they forgot to get their watch from the jeweler's or some other place, or that they have some extremely important personal business to attend to, but they cannot confide its nature to the executive officer. A week before sailing announce the policy, no leave except in emergency cases will be granted later than midnight Tuesday, and it is expected to grant regular liberty until midnight Thursday, sailing Friday at 0700. Every man is advised to adjust his personal affairs well before the day of sailing so that there will be no pierhead leaps. Without such an announcement, if a man asks for extended liberty and is turned down, he will subconsciously start sulking a bit, although it is due to his own conduct. Set the pace, and everybody will be happier in the end.

Eliminate temptation and misunderstanding. When liberty expires before the regular time have the word passed at quarters, pass the word again when liberty is started, and have the gangway watch inform each man when he is checked off the liberty list. Make allowance that a lot of people in this world have to hear something two or three times before any impression is made on their mental images.

After all, a lot of men don't know they are having a good time until someone tells them about it. You have to let them know they are the crest of the wave. In their off hours they read books of hazard, action, and sea stories. They dream of foreign lands and never see the adventure in their daily lives. In Panama, they think of China. Signalize the fact that they are in a distant and strange port. In the Canal Zone, only to a few does it occur to use Republic of Panama stamps on their mail. Post a notice something like this:

> Let the folks at home know you are in a foreign port. Use Republic of Panama stamps. Cost the same as U. S. postage. Give money and mail to mail clerk, He'll do the rest.

Don't throw up the sponge because the race-boat crew shows no enthusiasm. Bill Jones had the midwatch. He complains of lack of sleep. At quarters George Smith was told to get a hair cut. At that very moment an old time ailment—a wrenched back—suddenly returns. Harry Gish did not have the electrical storeroom shipshape at captain's inspection. As a direct result he realizes that he's too old for race boating, all played out. Have the ship service buy

some new athletic shirts with the ship's name or number on them. You'll find them a wonderful panacea, a substitute for white corpuscles, elixir of youth, glands, or whatever is needed. Many an imaginary ill will disappear before those shirts.

Make the ship a community with the men self-sufficient to themselves. After a siege at the rifle range, publish at quarters the ship's best rifle shot, the ship's best pistol shot. Announce the names of the best pointing group at gunnery practice, the torpedomen whose torpedoes made the hits, the fireroom watch that had the best steaming record for the week or month. Create a set of ship's personages. You will find that some hard-working, self-effacing man whom others had hardly known by name, is now regarded as a picked man. The men acquire more respect for each other's ability. A ship's spirit is built up on sound principles.

Look at the decisive factor of personnel in the World War. The old German High Seas Fleet ranked second to none in hull construction, engineering, ordnance, and scientific methods of operation. The material was excellent. The moral fiber was too, until the mutiny of the German sailors at Wilhelmshaven spread to a complete disintegration of the military forces, and the total collapse of the German monarchy.

The time to think about true and firm justice is before the delinquency occurs. Use the rudder of intelligence and foresight in directing the thoughts and efforts of the enlisted men, keeping them in the channel of efficiency and contentment. With the crew in a robustly healthy, mental state, an excellent course is laid for accomplishing well all duties at hand.

THE LOBSTER GHOST

An Episode of the Near Past

By Commander Raymond Stone, U. S. Navy (Retired)

DURING the summer of the "One Hundred Days' War," by which name the Spanish-American conflict of 1898 was pretty generally known throughout the naval service, our good ship *Taddledeaddly* was employed in the pleasant and important, though somewhat arduous duty, of training apprentices for the fleet; and in the performance of this duty she was assigned to cruise and patrol along the Atlantic Coast of the United States between Chesapeake Bay entrance and Bar Harbor, Maine,

At first, deterred by the fear of capture by the dreaded Spanish Cruiser Squadron, which in the vivid imagination of summer resorters (and a few others in high position) was bound on its way to ravage our northeastern coasts, we were, by departmental orders, restricted to Chesapeake Bay for cruising ground. As time wore on, however, and neither Portland, Boston, nor New York had been invested, bombarded, or placed in jeopardy of delivering up hard cash in forced contribution to the sea invaders, permission was granted us to make a dash for Newport. And dash we did, under steam and all sail, at times attaining unto the speed of seven knots per hour; and in due (some thought it overdue) season were piloted through the intricacies of Newport's mine fields up to the mooring buoy off the training station at Coaster's Harbor Island. From this station we received some 200 apprentice boys for their introduction to existence—I had almost said life—on the ocean deep.

For a while this ocean deep was found within the landlocked sounds of Nantucket and Martha's Vineyard, where we carried on many forms of drilling and exercising by day; anchoring before sundown in order to hook a few codfish and skates and to procure some much needed rest or, as one of my youthful shipmates was wont to say, "to hoist in and stow away a bit of reserve buoyancy."

From these pleasant hunting, I mean fishing, grounds, throwing all caution to the prevailing winds, a deep-sea cruise across the gulf of Maine was accomplished, at the end of which the desired haven of Northwest Harbor furnished acceptable holding ground for our mud-hook. Here the summer colonists did all in their power to heroize our boys, hailing as saviors from the enemy raiders these "men behind the guns" in the making.

Among our officers was a chaplain, newcaught and all that. Although not written of him, the description in the child's picture-book of one Mr. Jinks, who was "round and fat and jolly, and full of fun and folly," might, with little stretch of the imagination, be taken to fit our dominie right well. His interest in everything, coming, going, or standing still, under way or at anchor, was keen. He was kind-heartedness personified. He was shocked at the first weekly shooting of Charley Noble[1] after his arrival on board, but was subsequently converted to the view that this form of discipline was, under the circumstances, necessary. Two of his individual characteristics were outstanding: he still adhered to the old and time-honored garment called nightshirt and he possessed an appetite which was usually fair to middling tending towards good, with a predilection for tasty food.

The arrival at Portland, our next port of call, meant lobsters to eat. I would have you bear in mind that at the time of this incident, some thirty years ago, that delicious sea food, that submarine crustacean, the lobster, had not yet been numbered among the species extinct. Good things to eat were most acceptable to all the ship's company, officers,

[1] The ship's galley smoke pipe in which a blank pistol charge was fired once a week to loosen and clear out soot.

men, and boys alike, after some days of indulgence in unrefrigerated, air-tight, and desiccated provender.

Skinner, the wardroom steward, and an excellent one too, of Ethiopian lineage, familiar with the abilities of our mess along certain lines of endeavor, prepared a large and splendid lobster salad composed of "shorts" purchased from a bumboat alongside at a reasonable price because they were legally unsalable on shore. What followed may, by some, be taken to point the moral that the sale of "shorts" being contrary to the law, the eating of the same, like virtue, brings its own reward, or penalty, and that right soon.

But on with the spinning of the yarn.

At luncheon, the mound of delicious white and red meat, underlaid with leaves of crisp lettuce and overlaid with rich *sauce mayonnaise*, was attacked with vigor by the valiant trenchermen arrayed against it and speedily went the way of all good salad, washed down by real liquid refreshment of approved quality and bouquet; for in those days the fruit of the vine had not yet been pronounced anathema.

But soon the trouble began to brew and, as in the case of John (ny Jones) and (his sister) Sue, the "medicine man" could not subdue (it), for he was sorely afflicted too.

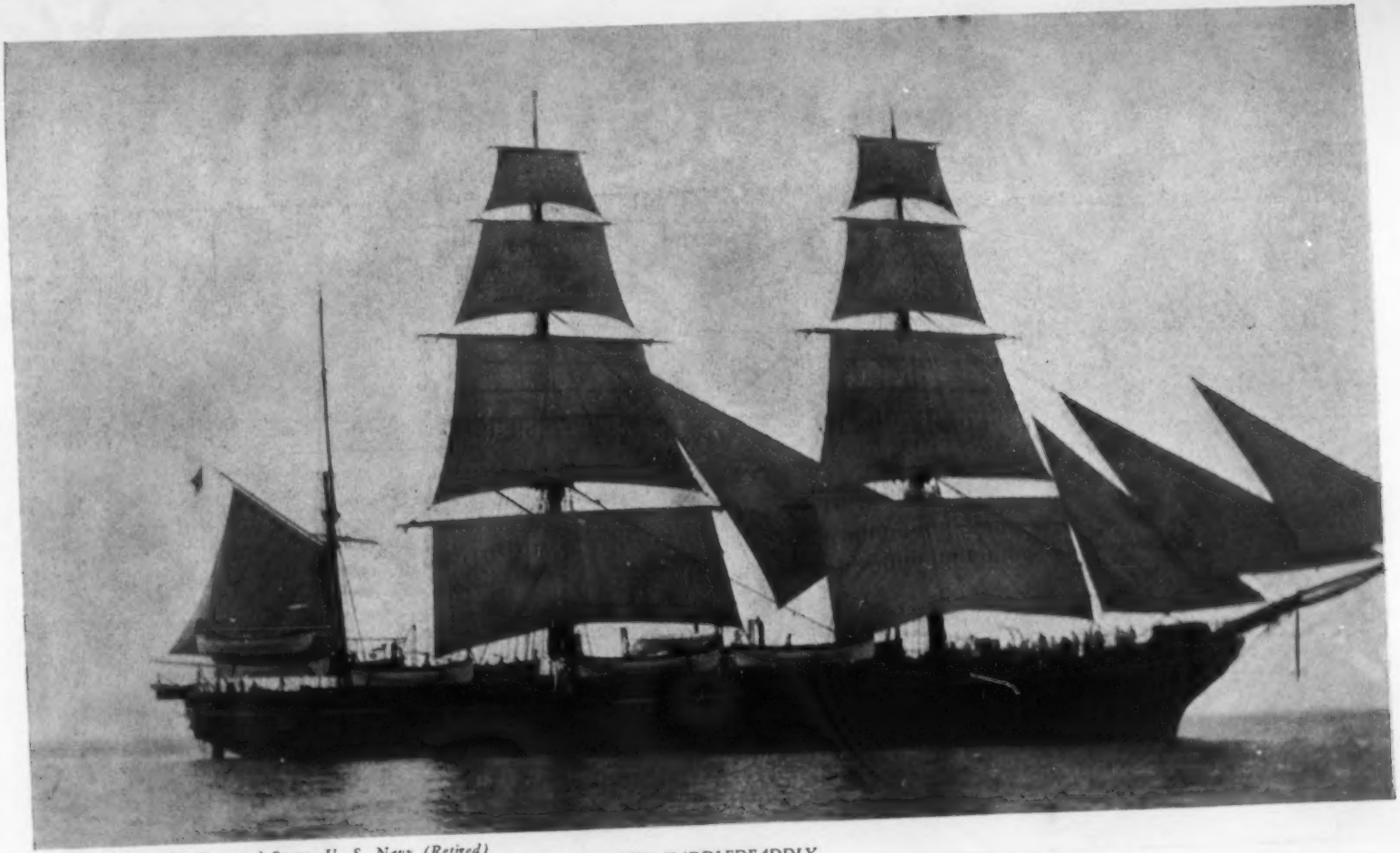
By the time the first dog had rolled round there was only one watch officer available for duty. Ptomaine germs had triumphed over the others and laid them low. By sunset the wardroom country was resounding with the moans and groans of the unhappy gourmands prostrate in their bunks; that is, all of us except the *padre* who, strangely enough and to the surprise and comment of us others, had for some unknown reason reneged on the salad. The mess boys were also stricken and lying down and out in their quarters forward.

Naturally the calls on the chaplain for aid and comfort were numerous and insistent; for a season his was the strenuous life indeed.

In order to attire himself coolly, suitably to the occasion, and with due regard to the sanitary requirements, the chaplain had donned his *robe de nuit* as aforementioned, a wonderful garment, wavy and flowing, of dazzling white in the noonday light but vague and spooky in the dim and not entirely religious oil-lamp illumination of the lower decks. Some time later his mission of mercy took him forward to the sick bay on the gun deck; so hither he journeyed, his flowing robe en train. Midway of the journey, hearing groans among some figures of men lying prone upon the deck, he stopped and leaned over, peering at them in order to locate the woeful one and administer to his needs. Just at this moment Skinner, for it was none other than he in dire distress, having partaken liberally of his own iniquitous handiwork, roused up from a troubled dream and in the gloaming glimpsed the vision in white. In one bound he was on his feet and, with a whoop and a yell, "Lord a'mighty, Ghosts, I'm dead!" made straight and swift for the after hatch ladder, the "ghost" following close at his heals in an endeavor to explain. But to Skinner's mind explanations were not in order at that time and place; he was fleeing to save his dear life. Up the ladder he went to the starboard side of the quarterdeck, thereby committing a grave breach of naval etiquette; but etiquette was the least of his current troubles. On deck, confused and bewildered, he turned forward and sped down the starboard gangway along the waist of the ship; and still the portly villain ghost chased him, "faint, yet pursuing" (a very appropriate condition for a sky pilot). Others, aroused from their first deep slumber and only partly awake, joined in the chase. In desperation Skinner doubled aft on the port side. His goal was the taffrail and overboard. Better, to his mind, was the certainty of drowning easily and simply than the haunting terror of being pursued by a ghost. The unsprouted wings of his future state lent speed to his lagging, dragging feet. Breathless he raced, the chasing pack in full cry.

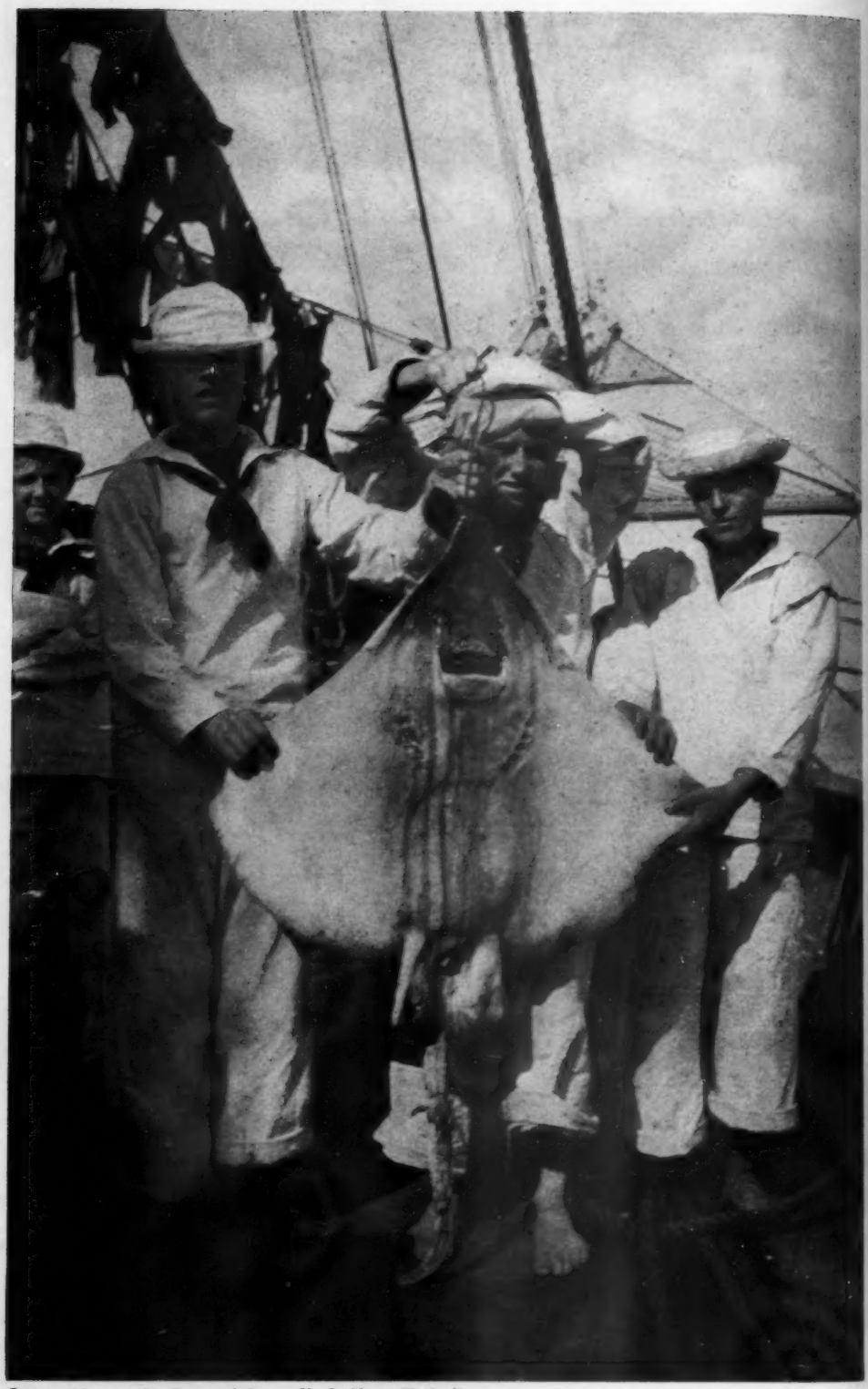
Abreast the steering wheel a kindly quartermaster tripped him up and, ignorant of the motives underlying this strange steeplechase by night, pinned the fugitive to the deck where, in spite of desperate struggles, he was held by arriving reënforcements until the puffing, panting "ghost" came on the scene. Skinner gave himself up for lost.

After awhile he quieted down. When the identity of his ghostly pursuer dawned upon his returning consciousness, he sheepishly remarked, "Lordy, Chaplain, I might a'knowed 't wuz you, only I never 'spected to see you in angel cloze."



Courtesy Commander Raymond Stone, U. S. Navy (Retired)

THE *TADDLEDEADDLY*



Courtesy Commander Raymond Stone, U. S. Navy (Retired)

A SKATE OF NANTUCKET SOUND

Note the length and spread of the skate as compared to the size of the apprentice boys.

Courtesy Commander C. H. J. Keppler, U. S. Navy

GENERAL VIEW OF ECLIPSE EXPEDITION CAMERAS

Left to right: 63-foot tower camera; 65-foot horizontal camera; 81- and 104-inch cameras, and twin "Einstein" camera.

Courtesy Commander C. H. J. Keppler, U. S. Navy

THE ONLY LANDING SPOT ON NIUAFOOU

This is where the U. S. Naval Observatory Eclipse Expedition, 1930, landed.

Courtesy Commander C. H. J. Keppler, U. S. Navy

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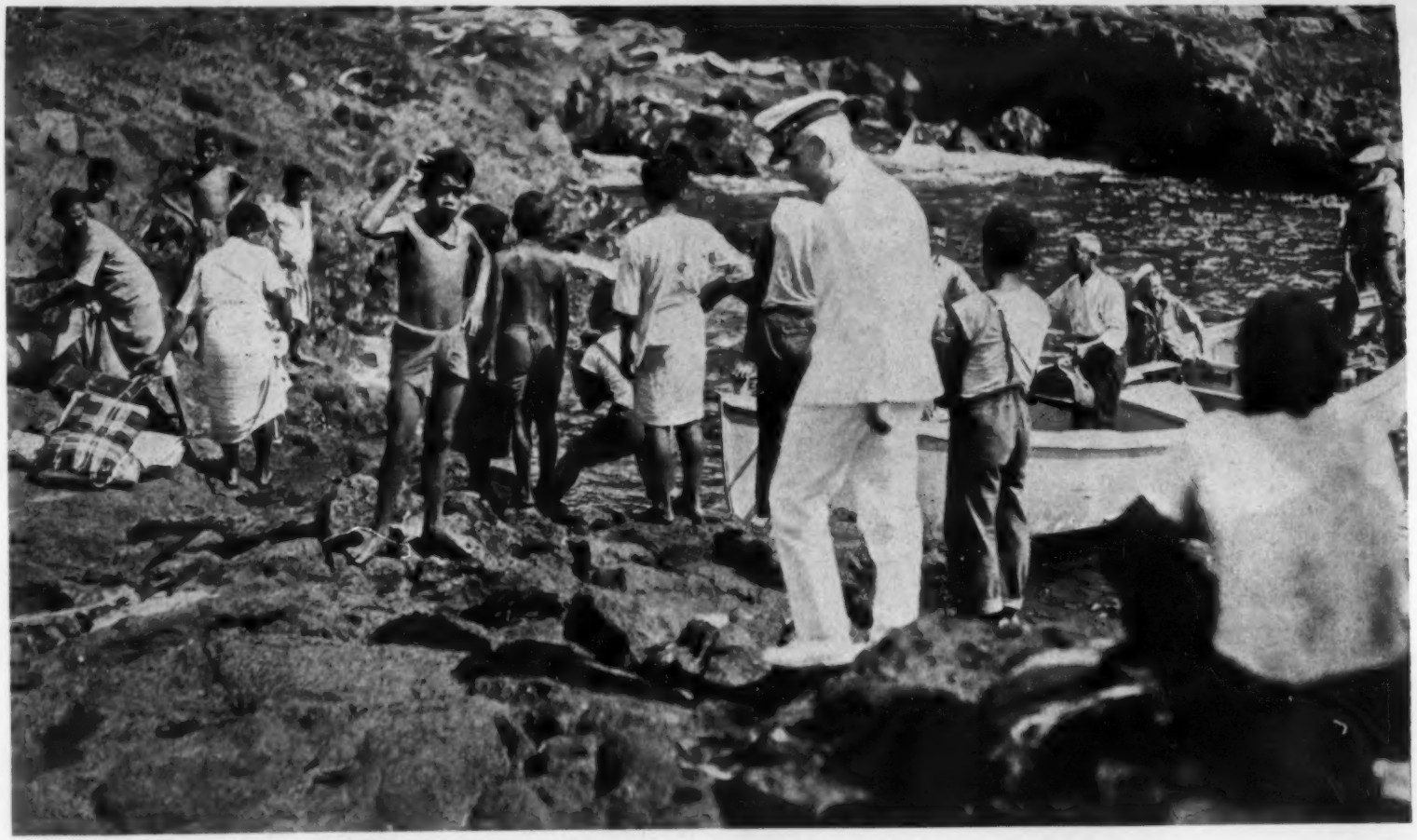
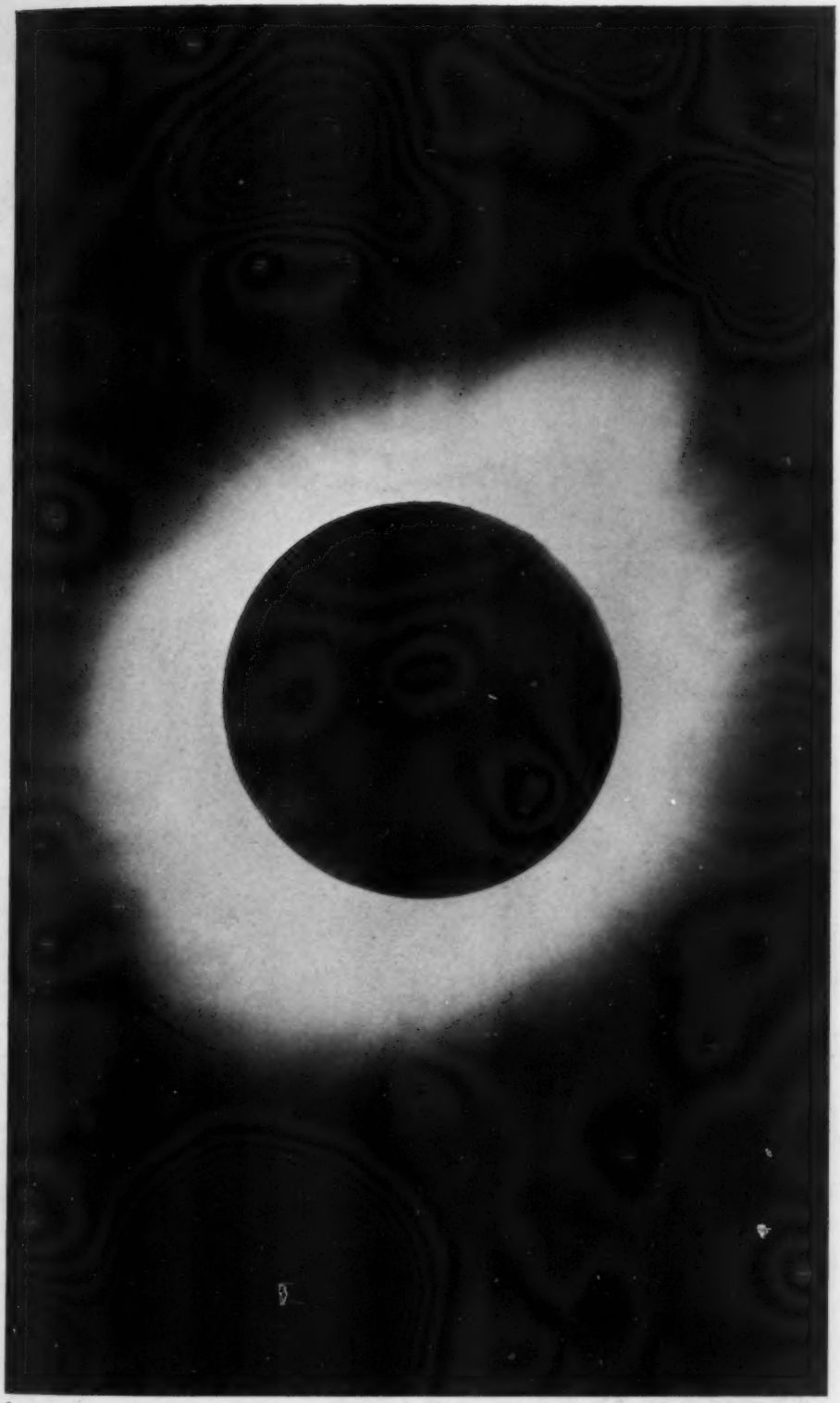


Courtesy Commander C. H. J. Keppler, U. S. Navy

THE FIRST LANDING AT NIUAFOOU

Courtesy Commander C. H. J. Keppler, U. S. Navy

THE "TIN CAN MAIL"

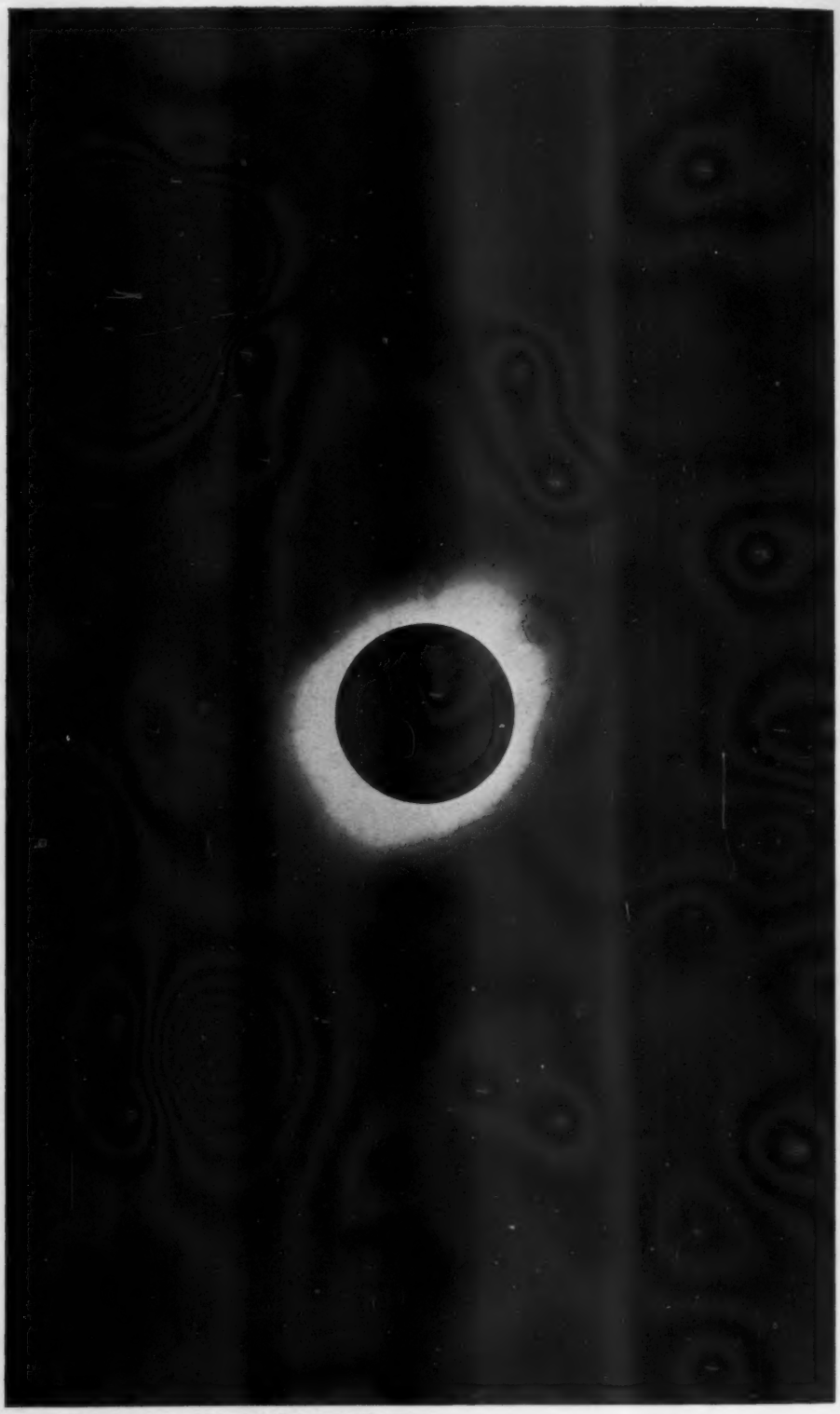


Courtesy Commander C. H. J. Keppler, U. S. Navy *Photograph by Professor Marriott, Swarthmore College*

TOTAL ECLIPSE

Sixty-seconds exposure with 15-foot camera, from Swarthmore College, for observations of the "Einstein Effect." Star fields were also exposed on this plate the night before the eclipse.

Courtesy Commander C. H. J. Keppler, U. S. Navy



Courtesy Commander C. H. J. Keppler, U. S. Navy

CORONA

AN ECLIPSE EXPEDITION TO THE SOUTH SEAS

By Commander C. H. J. Keppler, U. S. Navy

Editor's Note: The author was in charge of the U. S. Naval Observatory eclipse expedition to Niuafoou Island, Tonga, August to November, 1930.

AN ISLAND in a lake in an island in a lake in an island in the South Pacific."

An island where no one is troubled by flies or mosquitoes nor are there any snakes or reptiles other than small black and green lizards, pretty and harmless.

An island where the inhabitants are carefree, friendly, hospitable, curious, and absolutely honest.

An island where money means fifteen shillings today or three shillings tomorrow for the same grass mat, depending upon whether the native wants a white shirt or a tin of fish.

A tropical island where men, women, and children, dogs, pigs, chickens, and ponies depend upon the water in the green coconut when the rains fail and the cisterns run dry.

An island where the mail is carried out to the steamer held aloft on a stick by a swimming native, and the steamer, which passes by once every four to six weeks, throws the island mail overboard in a sealed tin can which the swimmer tows ashore, whence the nickname "Tin Can Island."

An island where it is too much trouble to fish, and when fish is to be had, it is sardines or salmon imported by the two white traders who enjoy life as so often portrayed in stories of the South Seas.

On an island like this twenty-three members of the U. S. Naval Observatory Eclipse Expedition, including fifteen bluejackets and marines, worked hard for ten weeks to be ready for ninety-three seconds of darkness, while the moon obscured the sun on October 21, 1930.

The expedition arrived at Tutuila, American Samoa, on August 13, and remained there five days while the U. S. S. *Tanager*, which had been detailed by the Navy Department to act as the expedition tender, and the Tutuila Naval Station tug *Ontario*, were loaded with nearly sixty tons of stores, food, tentage, camp equipage, and scientific apparatus. They also carried about twelve thousand feet of lumber required in the construction of the various cameras and other astronomical instruments necessary for making the intended observations of the total eclipse.

We left Samoa at daylight on August 18, and arrived off the north coast of Niuafoou the next afternoon. Here the shore consists of rocky lava spurs projecting to the edge of deep water and backed by cliffs seventy to one hundred feet high rising abruptly from the sea. Under ideal weather conditions landing is possible at a very small rocky cove near the village of Angaha. This location is the only spot available for safely landing personnel or stores and even here the operation is hazardous, as at the very time of flat calms the big Pacific swells roll in and getting ashore usually means a "good ducking." Luck was with us, however, as for two days there was a calm sea and all equipment, including the eleven-hundred pound twin tube of the "Einstein" camera, was landed on the lava rocks from the traders' small boat with the assistance of excellent seamanship on the part of the native boatmen and the crew of the *Tanager*.

Niuafoou is an almost circular crater island shaped like a huge doughnut four and one-half to five miles in diameter, lying about 310 miles west southwest from Samoa. It is purely volcanic and has been thrown up from the ocean depths of more than a thousand fathoms. It is not protected, as many South Sea Islands are, by a fringing coral reef. The circular narrow ridge of volcanic rock and ash, two to eight hundred feet high, encloses a beautiful lake nearly three miles across and whose surface is about seventy

feet above sea level. This lake has three wooded islets in it, one of which contains two small crater lakes and one of these lakes in turn has a tiny island near its middle. Whence we found, "an island in a lake in an island in a lake in an island in the South Pacific."

The large lake averages over 200 feet in depth, has a surface temperature of 82° F., with several small lagoons 98° F., on its southern shore which give off sulphurous gases. The lake water has a pronounced mineral or "spa like" flavor but is unfit for drinking purposes and is so charged with gas that the water bubbles vigorously. There are no fish in the lake, but tiny shrimp and crabs were found.

Niuafoou belongs to the Tongan Archipelago and is the only remaining self-governing kingdom in the south seas. Tonga is ruled over by Queen Salote Tabou and a Parliament. The Queen's husband is the Premier. The capital is at Nukualofa on the southernmost and largest island of the group, Tongatabu. The foreign affairs of Tonga are conducted under the administration of New Zealand.

The natives are Polynesians, of light reddish brown skin, well formed, erect in bearing, with handsome features and dark expressive eyes. The young women have beautiful figures, but like all native women of the tropics do not retain a good figure long, and more especially so after they begin raising the large families that are still the fashion. The men are courteous and sober and consider it undignified to appear in public without a shirt or coat which is always worn on ceremonial occasions and to church.

The island is a paradise of huge coconut trees and one of the few in the South Pacific where the coconuts have not been attacked by the rhinoceros beetle. This good fortune is probably due to its isolated position and lack of communication with the outside world. The tree grows very tall, the roots forming a dense network extending in all directions for many feet, which enables it to withstand the strong trade winds. The coconut tree gives the natives shelter, food, and drink. There are no streams on the island and no fresh water except rain water, which is caught in small cisterns or tanks, but is quickly used up in the dry season. The water of the green coconut is the universal beverage on Niuafoou, and makes a most wholesome drink, as even on the warmest days this water from a nut just picked off the tree is cool and very refreshing. Fresh water used by the expedition, for developing and washing more than a hundred precious photographic plates and films obtained on eclipse day, had to be brought ashore in eight-gallon breakers from the *Tanager*, and after it had served this purpose was used by the expedition for "face and dish washing."

Niuafoou is the home of that rare and interesting bird the "megapod pritchardi," native name, *malau*, a bird about the size of a small pigeon but which lays an egg as large as an egg of a turkey. The malau lays this buff-colored egg in the warm volcanic ash of the hills on the western side of the lake. It buries the egg from three to six feet deep in the ash and completely covers up the hole. The temperature of the ash in this neighborhood never gets below about 100° F. The egg accordingly is laid in a sort of "Dutch oven nest" and forgotten thereafter by the mother bird. Incubation is only a matter of time and when the egg is hatched the chick scratches its way out of the ash and thereafter shifts for itself.

Major eruptions occurred on Niuafoou in 1853, 1886, 1912, and 1929. This last eruption began about three o'clock on the morning of July 25, and lasted only six or seven hours. During this short period, however, immense cracks opened along a north and south line, the red hot lava poured forth and rolled down to the sea in a westerly direction, completely destroying the village of Futu. This village was the second largest on Niuafoou and near the only sloping beach on the island. Here the small trading schooners that occasionally visit the place during the favorable season of the southeast trades were accustomed to anchor. The inhabitants, leaving every possession behind, managed to escape to the eastward and gain the high ridge before the cracks in the earth opened too wide or before the lava flow, along a three mile front, had cut off the trail along the beach leading to the hills that form the western side of the old crater. A drizzling rain added to their misery. Many fled naked, and over all hung the pall of oncoming fire from the east with the trade wind bringing its deathly odor of sulphurous fumes. Today the black lava presents a barrier around Futu with very broken sharp ridges thirty to fifty feet high and deep wide

fissures with many vents and fumaroles still steaming and smoking. The "Futuites" have settled in a new area called Esia near the village of Angaha. A most conspicuous sight in this black lava field, next to the white concrete walls of what was the little church, are the hundreds of "tree molds" formed by the hot lava building up around the coconut palms. The tree trunks of course were completely burned, and, after the lava cooled, these hollow black rock casings were left standing, some of them nearly fifteen feet high. These tree molds now look like so many huge sentinels warning the puny inhabitants to properly respect the slumbering forces that lie underneath their flimsy abodes.

From the moment of our arrival the natives, plus the two white traders, gave us every assistance their primitive facilities could afford; were keenly interested, though extremely doubtful, in our success, and after radio communication was established with Nukualofa, Her Majesty and the Premier greeted us as follows: "Extend most cordial wishes for success of the expedition and trust the personnel are enjoying health and such accommodations as available."

At all times the people were friendly, hospitable, curious, and especially obliging. By nature and environment they are care-free, happy, lazy, and shun heavy or continuous work, so were amazed at all our energetic activities and, except for their skill and ability in seamanship and the handling of their own boats, could not be relied upon for even a few hours steady, hard work. They were in and around the camp at all hours of the day or night, when not attending one of the missionary churches. Four or five times each day they did go to these churches, where they sang interminable hymns with much gusto but very pleasing harmony.

September 28 was an epochal day in the history of Niuafoou. The arrival of three ships and the dedication of the Tongan government radio station, which had been under construction for about a month, provided the occasion for a grand celebration and feast. From early morning until nearly midnight very picturesque and unusual exercises were held by the inhabitants of the nine villages on the island. Competitive singing and dancing by all ages, both sexes, in elaborate costumes of beads, grass skirts, tapa cloths, and many colored decorations took up several hours, after which all hands joined in a sumptuous feast of roast pigs, chickens, tropical fruits, and native delicacies. The eclipse expedition members reviewed the proceedings from a raised platform with the high chiefs and were delivered their share of the food, most of which was returned later in the evening to those natives who "happened" to be in the camp expecting such disposition.

As a precaution against interference with eclipse operations, arrangements were made with the High Chief Fotofili that no natives were to be within the eclipse camp before and during eclipse time. This agreement was so well observed that not a soul came within two hundred yards of the area until invited to do so. Shortly after totality they were allowed to come in camp and given an opportunity to view the sun and the moon through the 3-inch telescope. They were at all times quiet, dignified, but extremely interested in all our actions and had lately offered many prayers for a "successful eclipse." A few of the "doubting Thomases" wagered a pig against a shirt with one of the sons of Mr. Quensell, the trader, that nothing would happen, so that young lad now owns more than his share of their favorite food, "next to roast dog!"

Another important trait to the credit of these people was their honesty and integrity concerning any property whatever belong- to our and the New Zealand expeditions. No instances of any theft or petty thievery of stores, tools, food, or equipment were reported. Towards the end of our stay they brought in presents of many fine pieces of grass mats, "falas," and tapa cloths.

Finally, on the morning of our departure, at least half the population of the island including High Chief Fotofili, his son-in-law and future successor, Fusitua, and Kaufusi, the magistrate, with their families were down on the landing spot to bid us farewell. They all expressed genuine regret and many sincere "tofas" at our departure and were particular to inform us, through the trader interpreters, how much they enjoyed having the scientists of America "honor Niuafoou" with such a distinguished visit.

NEW DESTROYERS

By Lieutenant Commander G. D. Hull, U. S. Navy

OUR present fleet of eighty-six active destroyers is scarcely ten years old. Although some fifty of them have been recommissioned recently and have had but two or three years' active duty wear and tear back in 1920-22, they remain fifteen years old in design. Our decommissioned destroyers in reserve, about seventy, are of poor design and only fit for recomissioning in case of serious emergency.

It seems probable, from the foregoing, that some new destroyers will soon be authorized.[1] On new ships it seems proverbial that the people who put them in commission always have the same general tale to tell. "Now I wonder why this was designed thus and so; if I had done it, I would have done it this way."

The people who put these new destroyers in commission will probably repeat the same old story. As an old offender in postcommission criticism the following precommission design is herewith offered without apology, as being perhaps of interest at this time.

We must always bear in mind that a destroyer to be a real warship must carry a real menace against capital ships and submarines. It must also be able to protect itself from vessels of similar type, and against aircraft, the only thing speedier than itself.

The London treaty limits destroyers to 1,500 standard tons. A study of the strategical and tactical characteristics desired by this country in a destroyer discloses the fact that 1,500 tons is just about the right size for us, allowing as it does maximum torpedo and good gun armament coupled with high speed, long cruising radius, and good seagoing qualities.

General features.

Displacement, standard tons	1,500
Displacement, with fuel oil and feed water	2,000
Length	320 ft.
Breadth	36 ft.
Draft, standard displacement	10 ft.

[1] The last Congress recently appropriated for eleven.

It will be noted that the breadth to length ratio is the same as for the new cruisers, namely about 8.7. This should give much better seagoing qualities than our old destroyers which have a 10 to 1 ratio. The guns will have much greater loading room, the roll will be reduced, greater stability will result, and it will give much better deck arrangement in general.

The underwater body of this proposed ship will be characterized by the old destroyers' V-bottom forward and a cutaway stern. The V-bottom forward is retained to reduce pounding in a head sea and the stern is cut away radically to improve the turning circle which is clumsily great in the old destroyers. The stern will be broader and the propellers will not project beyond the side of the ship, eliminating propeller guards.

The old high forecastle is resurrected in order to raise the bow and bridge and yet keep other top weights as low as possible. The boats will not be in high skids, but on deck where they will be much easier to handle than at present. The adoption of but two smoke pipes makes the foregoing possible and besides allows a much roomier main deck and better gun arrangement.

The foremast is a tripod supporting a gun director; the mainmast is eliminated entirely.

Armor.—The subject of armor seems out of place on a destroyer, and yet, bearing in mind the casualties a single fighting plane with a machine gun could inflict on the personnel of our present destroyers, means of protecting such exposed personnel must be adopted in any modern fighting ship. It is proposed in this vessel to use 10- to 15-pound special steel plate on sides and tops of bridge, fire control, and to fit to the guns wide apron shields under which most of the gun crew would be safe and could continue firing their guns in case of a strafing attack by aircraft. In addition, the anti-

aircraft machine guns and range finder would be fitted with protective hoods. Protective plates of this weight are worked into the gun-deck platform over the forward torpedo tubes, and the after torpedo tubes are fitted with a protective hood, thus rendering practically all of the exposed and vital personnel safe from what could on the present destroyers be a fatal disaster. The top weights additional for this purpose should not be prohibitively great.

Torpedo armament.—The present torpedo is not altogether effective against a modern battleship. The war head must be increased in size if any hope of crushing through the cellular bottom of a capital ship is desired. It is therefore proposed to adopt as the main armament, a battery of twelve, say, 25-inch torpedoes arranged in four sets of triple tubes as shown in the sketch. The adoption of a 25-inch torpedo will allow the use of about a 700-pound war head and an increase in torpedo range up to, perhaps 20,000 yards. The tube nests are brought well forward, which will facilitate torpedo control.

Gun armament.—It is proposed to adopt four center-line guns with the greatest arcs of fire possible. A gun on a destroyer must be small enough to take the largest fixed ammunition that one man can readily load in the gun. From this it appears that a 5.1-inch gun (largest allowed by London treaty) is out of the question and that the present 4-inch is too small. The present 5-inch semiautomatic antiaircraft gun on our capital ships could be adopted for destroyer use but its range is hardly great enough. It seems that a gun of about 4.5 inches, 40 to 45 calibers in length mounted on a high angle mount would be an ideal weapon for a destroyer.

A simple and light-weight hand-lever power-ram could be designed for use in loading this gun for high angle work instead of the heavy power loading device on our present 5-inch antiaircraft gun. Straight hand loading would be retained for serving this gun on the flat. A division of destroyers so armed could certainly spoil almost any kind of concentrated bombing attack on our battle line long before it arrived anywhere near the battleships. The characteristics of such a gun might be as follows:

Bore .....4.5 in
Length .....40 to 45 cal.
Weight of shell approximately.....40 lbs.
Weight of powder charge approximately..14 lbs.
Weight of cartridge approximately.....85 lbs.
(Present 4-inch 50-caliber.....73 lbs.)
Muzzle velocity approximately.....2,600 ft. sec.
Range maximum approximately.....20,000 yds.
Breech plug.....semiautomatic, sliding wedge.

Two combination antiaircraft and horizontal fire detectors are provided to control the above battery—one supported by the foremast tripod, the after one located on the deckhouse aft.

In addition three multiple barrel 0.5-inch antiaircraft machine guns are mounted, as in sketch, giving greatest arcs of unobstructed fire, particularly ahead and astern.

Depth charges would be carried in the usual manner of course.

General construction and repair features.—Patent anchors, eliminating billboards, and a deck watershed forward of the bow gun should result in a drier forecastle and help the service of the bow gun at high speeds. The present design of bringing the bridge structure to the sides of the vessel with water-tight doors for access to the forecastle will be retained, as it keeps an enormous amount of water out amidships in heavy weather. There will be plenty of room for main radio-room and galley forward of No. 1 smoke pipe as shown in sketch, together with a roomy charthouse (with lavatory) containing a bunk for the navigator. The bridge will be roomier than the present one and still leave plenty of room for an emergency cabin of the same size.

The refrigerating machinery will be placed in the auxiliaries' room with the cold storage immediately adjacent. In addition there will be patent ice boxes at the galley and the wardroom pantry. The cold storage will be opened but once a day; the smaller boxes will contain only a day's supply. This should obviate the trouble now experienced by the constant opening of the single cold storage box.

The anchor windlass, hydraulic steering gear, and boat hoisting winch amidships will all be operated by Waterbury or Healy Shaw variable speed gears. The advantage of having electric leads instead of long steam pipes to the ends of the ship is obvious. Another advantage of the electric boat hoisting winch and anchor windlass is that both can be operated from an auxiliary, port, Diesel generator when the steam plant is secured.

The sides of this vessel are almost vertical and the guard rail is built in to be well above the water line.

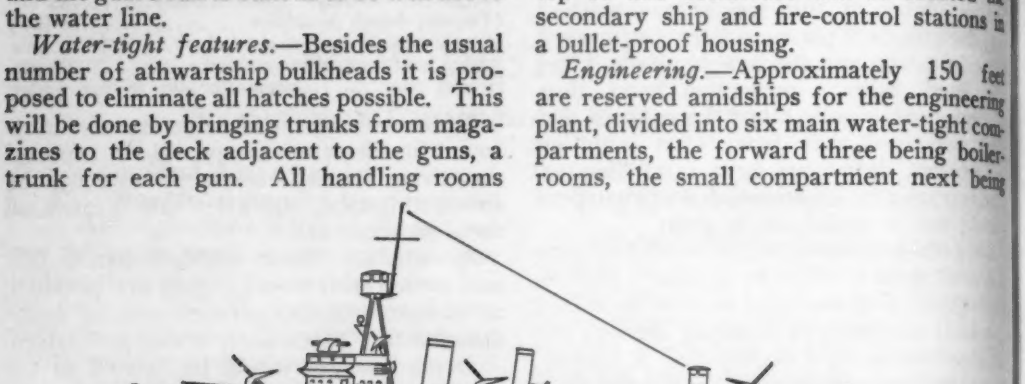
Water-tight features.—Besides the usual number of athwartship bulkheads it is proposed to eliminate all hatches possible. This will be done by bringing trunks from magazines to the deck adjacent to the guns, a trunk for each gun. All handling rooms will be eliminated, but hand-whip hoisting will be retained since weight prohibits power ammunition hoists. Access by trunk from weather deck will be provided for the steering gear room. This arrangement eliminates 80 per cent of the horizontal water-tight hatches below weather decks. All water-tight doors and air locks between compartments will be above the water line and should be a great improvement in the water-tight integrity of this ship over that of the old destroyers.

The general location of storerooms, except commissary and inflammable stores, will be above the tank tops in the engineering spaces.

The boat outfit should consist of two power whaleboats on the davits and one speed boat stowed amidships on deck cradles, the davits being high enough to rig the whaleboats in over the top of the speed boat.

The after deckhouse will contain an auxiliary radio and all ship's offices. On top of this deckhouse will be located the secondary ship and fire-control stations in a bullet-proof housing.

Engineering.—Approximately 150 feet are reserved amidships for the engineering plant, divided into six main water-tight compartments, the forward three being boiler-rooms, the small compartment next being the auxiliaries room, and the after two being engine-rooms.



SKELETON PROFILE AND PLAN, SHOWING GENERAL ARRANGEMENT OF PROPOSED DESTROYER

Boilers.—Three express-type boilers of approximately 15,000 square feet heating surface operating at about 400 pounds guage and 600 degrees F. total temperature are suggested. Each boiler will be placed in its own water-tight compartment together with feed heater, blowers, oil pumps, and all other auxiliaries necessary for the service of a boiler. The piping in the firerooms will be so arranged that the least casualty will be suffered by the plant as a whole if a fireroom is suddenly disabled. In this regard, one suggestion would be to bring the main steam lines directly from the boiler to a level below the water line and place check valves in the main steam lines at this point. This would prevent the loss of steam on the main line if the boiler is ruptured.

Main engines.—To save weight and still obtain high power a high-speed turbine will be necessary. A two-shaft arrangement is

suggested with one H.P. and one L.P. Parson's type turbine operating through a reduction gear on each shaft. This will necessitate a reduction of from 10 to 1, turbine speed about 5,000, propeller speed no greater than 500. To economize on space and to eliminate exhaust trunks, turbine drains, etc., condensers will be underslung. To eliminate lubricating oil piping to a large degree, sump tanks will be formed as a portion of the gear casing with suitable baffling between tank and casing. All main engine auxiliaries will be divided equally between each engine-room; that is, a hot well with feed pump or pumps and a turbo-generator with switchboard in each engine-room. The electric auxiliaries of this ship together with fire-control installation make it imperative that the flooding of one engine-room does not destroy the ability of the ship to generate electricity.

Auxiliaries.—In the auxiliary room would be placed the evaporating plant, the cold storage box and machinery, the torpedo air compressors, and a Diesel generator exhausting through a very small waste heat boiler. In general the Diesel generator would be run at all times in port unless it was necessary to make fresh water. This last feature would enormously facilitate the upkeep of the main plant. The waste heat boiler would be only large enough to generate steam for galley apparatus and possibly some heating. The weight of this Diesel installation would appear to be justified by its great saving of fuel in port, if for no other reason.

Under way, the exhaust of the turbo-generators will be taken care of in the usual way. If the steam plant were in use in port for the purpose of making fresh water, the exhaust of the turbo-generators could be taken care of in the evaporators. An auxiliary condensing plant would therefore be of limited use and its size and weight could be reduced to a minimum.

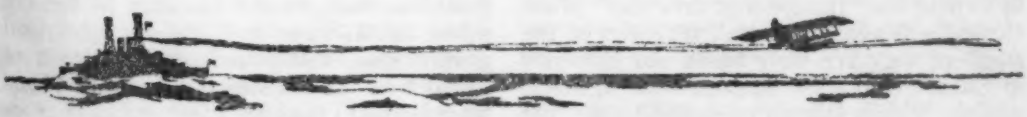
Fuel oil and fresh water tanks.—Fuel oil will be kept below the water line throughout and, besides the large forward tanks and the small after tank, it is proposed to build oil tanks on each side of the ship in the firerooms, and in the off side of each engine-room, certain sections of which can be used for feed and ship's water.

In view of the quality of oil the Navy now uses, the arrangement suggested will allow easy heating and pumping which may be considered an important feature in oil stowage. It is believed that this arrangement will allow the stowage of approximately 500 tons (150,000 gallons) of oil, which at economical speed should give this vessel a cruising radius of about 8,000 miles.

While no detailed computations have been made on the performance or distribution of weights involved in this plant, it is believed that a plant can be worked out on the lines indicated to give at least 50,000 s.hp., 38 knots, within the weight limitations imposed on a ship of this type. This estimate considers what the present plant in our old destroyers produces, and besides, the suggested plant would be much superior from a military point of view.

Crew and living spaces.—Such a vessel would require a complement of 125 men and 8 officers. The crew is berthed in the six large living compartments forward, the officers aft. From a computation of deck space available it appears that there would be one-third more room per man than on the old destroyers, making living conditions much superior. With the officer's quarters aft a real quarter-deck is gained.

It would be interesting indeed to hear more ideas on this subject; perhaps among them something of real value and originality may be obtained.



AMERICAN INTERESTS IN THE WEST INDIES

By Captain Elbridge Colby, U. S. Army

OUR whole interest in the Caribbean region arises from a geographical fact, potent in diplomacy and pertinent in international law. "Territorial propinquity" was a vital factor in the Lansing-Ishii agreement of 1917. It was specifically mentioned with regard to Morocco in the Anglo-French agreement of 1904. It was referred to by the Austrian government when enforcing the Treaty of Berlin (1878) in the Balkans. It was cited by Secretary Adams with regard to Florida and Amelia Island in 1818. It was potent in the formulation of the Monroe Doctrine which, fundamentally, is based upon "dangers to the peace and safety of the United States" which may arise in "neighboring territory."

We started most seriously into the West Indies when we intervened between Spain and Cuba. This we did for "the abatement of a nuisance" which was "almost in sight of our shores" and clearly becoming "injurious to the United States as a neighboring nation." This was not "dollar diplomacy" or "shirt sleeve diplomacy." It was not imperialism, but mere defensive action taken on account of territorial propinquity. We set Cuba up "free and independent" but we kept our hands ready to protect our own interests. We preferred to Americanize the Panama Canal rather than leave it international. We have followed in the Caribbean a protective and a stabilizing policy which aims to increase, amid the uncertain politics of the Caribbean republics, an American influence for law and order.

We have used diplomatic representation and military demonstration, when necessary, to extend the "frontiers of freedom" to include the islands and small republics to the south of us. We have based our influence in Cuba, Porto Rico, Santo Domingo, Haiti, and the Virgin Islands on sound lines. We have not only respected existing law but have secured valid agreements and contracts with the parties concerned, as it is not always possible to say that France or England or Japan or Germany secured with reference to the partition of Africa and the development of India and the dismemberment of Turkey. Ours is not the lust for power of an aggressive "Yanqui," imputed to us by frantic Latins, but rather a wish for peace and quiet in our immediate neighborhood.

Legal jurisdiction.—Through purchase by treaty from Denmark in 1917, we acquired unquestioned title to the Virgin Islands, including St. Thomas, the Gibraltar of the Caribbean. Our title is clear and our jurisdiction absolute. It had been said that a European power desired to acquire this valuable potential naval base. Such an acquisition might be a danger to us. The Lodge resolution of 1911, though meant to be applied to Magdalena Bay, reads:

> When any harbor or other place in the American continent is so situated that the occupation thereof for naval or military purposes might threaten the communications or safety of the United States, the government of the United States could not see without grave concern the possession of such harbor or other place by any corporation or association which has such a relation to another government as to give that government practical power of control for national purposes.

It was not the inconsequential bay rum and sugar commerce that concerned us with St. Thomas. It was its key position as a naval harbor at a point which might control the approach to the Panama Canal. So we bought it.

Our title to Porto Rico is every bit as clear. It came to us as part of the spoils of war by the Treaty of Paris of 1898. It was not that we cared for Porto Rico so much, as that we did not care to see any other nation have it. We set up a local government, recognized the "citizens of Porto Rico" as a distinct "body politic" and transferred to the local government all property rights in public buildings, works, and lands. We refrained from imposing the Anglo-American jury system upon people accustomed to Spanish civil law. But

we still retained some measure of control and supervision, notably the privilege of scrutinizing railway, telegraph, and telephone franchises, things which might lead to financial entanglements with foreign nations, perhaps to another Venezuela episode.

When Spain relinquished claim to sovereignty over Cuba, it was provided in the treaty that when American occupation should cease the United States should *advise* Cuba to assume herself all obligations under international law. Our military government was "military in name only" as General Wood remarked, and by promoting civil courts and encouraging holding of public office by Cubans, came "as near as possible to government by the people." Yet, when the occupation did cease by the treaty of 1903, the United States took care to secure this neighboring territory from dangers to America peace and safety. The government of Cuba engaged not to make any treaty or compact with any foreign power which would impair her independence, not to permit colonization upon her territory, not to admit of military or naval control, and not to contract any public debt beyond conservative banking limits regarding interest payments and sinking fund provisions. Under the same treaty the United States is permitted to, and engages to, interfere "to protect the people of Cuba . . . property and individual liberty." But more important still, the United States may establish stations, not only for these purposes, but also "for its own defense." Naval strategy was not overlooked; indeed, it may perhaps have been fundamental.

American control in Haiti grew out of diplomatic and financial considerations, just such considerations as our policy has been sedulous to obviate in other Caribbean countries. Latin-American borrowings in Europe often led to delinquent accounts and to attempts to collect, as in the case of Venezuela, not only by diplomatic pressure, but actually by threat or demonstration of naval power. In 1901, President Roosevelt had said that even the Monroe Doctrine could not protect a delinquent nation from its own misdeeds and from punishment so long as such punishment did not take "the form of acquisition of territory by any non-American power." To save the need for forceful application of the Monroe Doctrine against European nations, it then seemed advisable for the United States to take the first step, to take vigorous action herself to prevent Germany becoming too aggressive over a gunboat incident, and France, over a mix-up with legation guards. By the Treaty of 1915, the United States agreed to develop Haitian resources and to establish Haitian finances "on a firm and solid basis."

This treaty gave us great power, almost as great as we could have acquired by an annexation or by formal protectorate. We were to have a receiver of customs, a constabulary, a financial adviser, and a supervising engineer. But our purpose was no commercial exploitation. It was protection of ourselves in view of "territorial propinquity." We restricted foreign powers from securing jurisdiction by sale or lease. The treaty provided that "should the necessity occur, the United States will lend an efficient aid for the preservation of Haitian independence" (*which is an international matter relating to the Monroe Doctrine*) and "the maintenance of a government adequate for the protection of life, property, and individual liberty" (*which is distinctly an internal matter relating to detailed American control).* By these clauses and agreements are justified, without question or cavil, under international law, the numerous detachments of United States marines amid the jungles and among the negroes of that tropical and unstable republic.

We interested ourselves in the affairs of Santo Domingo at a time when that republic was threatened by debts and claims amounting to about $30,000,000 which had originated "during disturbed conditions of the Dominican Republic, some by regular and some by revolutionary governments, many of doubtful validity in whole or in part." We did not want to see a repetition of the Venezuela incident. By agreement, in 1907, we arranged to see all debts and claims settled for about $15,000,000 and practically to guarantee payment, and it was admitted that the whole plan of extricating the Dominican Republic from its embarrassing and dangerous situation was "conditioned and dependent upon the assistance of the United States in the collection of customs revenues." The agreement provided for us to appoint a general receiver of customs. But it will be particularly noticed that American authority is admitted, in the strict interpretation of the agreement of 1907, only to "the several

customs houses." In a legal sense, therefore, our authority was to extend only to the frontiers, and not to include financial advisers, sanitary engineers, Americanized constabulary, or possible internal intervention as in the case of Haiti.

It is only fair to admit therefore, that the occupation proclaimed in 1916 was a military and not a legal measure. The Dominicans agreed to the Convention of 1907 and signed it. They did not agree to the order of occupation. They certainly never signed it. We have used marines and have been criticized for so doing. But it is to be noted that it was marines we used, and marines by a growing custom of international law, are being considered more occasional and less permanent a force, less of a violation of local sovereignty than would be the use of regular army troops. Readily and speedily capable of being landed from ships, they are looked upon as local emergency protection. They do not create the same popular excitement as would the moving of army organizations from home garrisons. They look like a temporary expedient. We don't really care to annex Santo Domingo and don't want to appear to care to do so. In 1905 Secretary Hay announced we did not want to annex, either by force or by negotiation; that even if Haiti wanted to join us "there would be no inclination on the part of the American government or in public opinion to accept such a proposal." There are, of course, Latin Americans who doubt our motives and impugn our honesty of purpose, even when they saw the surprising way in which we fulfilled with regard to Cuba the provisions of the "self-denying ordinance" of 1898. But there are others who speak like this gentleman of Santo Domingo, who remarked:

> I have no right to doubt the sincerity of those who, possessing Cuba, a hundred times richer than we, a hundred times more easily governed, retired thence voluntarily and raised the island to the high rank of a sovereign state.

Our steps toward legal control are aimed to protect ourselves on account of the "territorial propinquity" of the West Indies. They are not aimed at annexation or conquest. And we might as well be frank, the principal reason we do not desire annexation of these peoples is that *they* do not desire it. There is too much black blood in those countries for our convenience. We have enough of it ourselves. Haiti is a negro republic and the United States is a white republic. The difference is as great as that between black and white. We have, of course, democracy in politics, irrespective of color, but we do not have, in the same matter, democracy in labor or in social relations. The negroes of the West Indies know this, and are accordingly inclined to be unfriendly and hostile to us. They will trade with us. They will accept our aid in finance and in politics. They will allow us to increase their customs receipts and to sit on the lid of their revolutions. But they will not feel with us or think with us. They are suspicious of our advances, our influence, and of our prejudices. We have a prejudice against the type of people who form the major part of the population in Haiti, Martinique, Jamaica, Barbados, and Santo Domingo. They have a prejudice against us. They know of our prejudice probably more than we know of theirs, and they resent it more. With this feeling in existence, it would be foolish for us to seize Haiti or to purchase Jamaica. And we know it. But knowing all of this does not in the least diminish our interest in this region, an interest founded on its nearness to us and stimulated by strategic considerations.

Vital considerations.—With such definite bases, it is not surprising that we should be supreme in the West Indies, that we should exert an influence far beyond mere formal phrases and conventional agreements, that we should have become in a sense "the policemen of the Caribbean." It is a perfectly true theory that under international law "Russia and Geneva have equal rights" but it must also be recognized, as Admiral Stockton so wisely remarked, "that states, like individuals, exercise power in proportion to their influence, strength, and riches." We once were interested in protecting the Gulf of Mexico. We have a naval base, small and antiquated, at Key West. We once thought of getting a foothold in Yucatan, and later of getting on the Isle of Pines, in order to insure protection of the westward route around Cuba. But our view has now extended. The Isthmus of Panama has risen in prominence, ever since the first California-bound gold-seeker went up the river and across the jungles from Colon to Panama City. With the transisthmian route

creating an almost continuous shore line from Maine to Seattle, our strategy had to look farther south.

So looking, we had to predicate our progress upon the elimination of Great Britain, that power whose mariners with almost uncanny foresight have secured the critical points of world shipping. The English had diplomatic arrangements which gave them a monopoly on isthmian canals. They maintained substantial garrisons on the West Indian islands and kept a good-sized fleet at Kingston. In 1850, by the Clayton-Bulwer Treaty, we secured a half-share in any possible canal. In 1901 by the Hay-Pauncefote Treaty, England withdrew from her established legal rights, and we are free to build the canal for ourselves. We promptly secured title to the passageway across Panama and, to protect ourselves from competition, also acquired rights to the Nicaraguan route. At about the same time, England turned her military and naval eyes from the Caribbean to more critical areas and moved off many of her troops and most of her fleet, leaving the United States in strategic control. Spain had disappeared in 1898. Denmark turned over St. Thomas in 1917. The French possessions are relatively unimportant. By the Cuban treaty of 1903, we were assured of a naval base at Guantanamo. We have Porto Rico, though strategically unimportant, and we have Key West. We have definitely prevented the chance of any other nation getting control of the Mole St. Nicholas in Haiti or of Samana Bay in Santo Domingo. Indeed, our line of strategical control extends from the southern tip of Florida in a huge semicircle to the coast of South America, almost enclosing the Caribbean as a lake. Great Britain still holds Jamaica and other good locations, but not in force. We are paramount. For a century we have watched the West Indies from the corners of our eyes. We have now strategic supremacy.

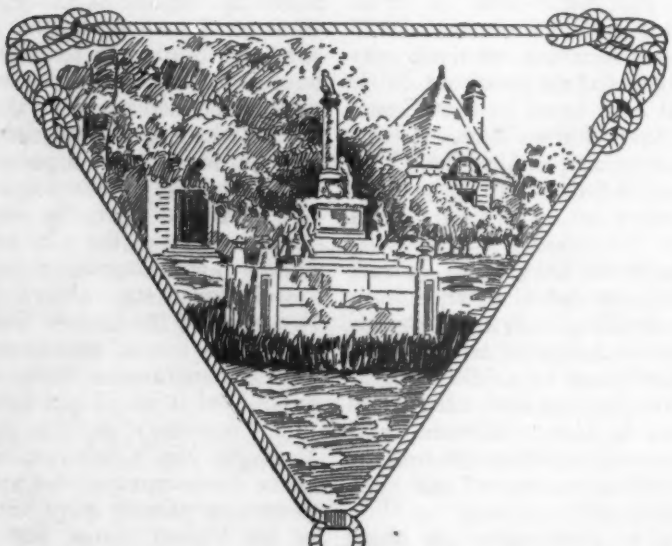
This is the end of a chapter of the Monroe Doctrine, not an altruistic policy to insure freedom on the Western Hemisphere, but a defensive policy to protect ourselves from neighboring peril from highly organized and well-supported military and naval force. We do not imagine that such a force could arise from the tropical regions of which we speak. But we have assured ourselves that those regions should not be made rallying points for more distant powers who might seek near-by bases from which to assail us. This is the Monroe Doctrine, a defensive doctrine dealing with territorial propinquity. We did not protest about the British claim to the Falkland Islands, they were too far distant. Indeed, it is not too much to say that the Monroe Doctrine has never seriously been invoked with regard to any region south of the equator. Europeans might "colonize" far to the south. When they showed their naval guns in or around the Caribbean, we became interested. Whether the next chapter of the practice of the Monroe Doctrine will take us farther south, it is not possible to predict, although it is almost safe to say that such an event now appears remote and impossible.

A little incident will illustrate a point, an incident which does not deal with finances or revolutions, with European creditors of turbulent governments or with Americans living beyond the seas. On the western reaches of the Caribbean is a tiny coral reef known as Roncador Cay, a menace to commerce, and the graveyard of many ships, including the old U.S.S. *Kearsarge*. It is close to the route to the Panama Canal. Without inquiry as to ownership, a lighthouse was put on this isolated and substantially unclaimed bit of coral. Early in 1919, a small sloop came into Colon and reported the light out. When a party from the lighthouse division of the Panama Canal went out to fix the light, the *intendente* of San Andres declared the reef under Colombian dominion and announced that the American vessels must stay away. Thereupon the President of the United States invoked the old "guano island" statute and formally proclaimed "sole and exclusive jurisdiction" and announced it an official lighthouse reservation "necessary in the public interests." Promptly the lighthouse recommenced its silent work, marking the path of commerce, protecting passing ships, including warships of the United States, and perfecting communications through the Panama Canal.

We are now recognized as the policemen of the Caribbean. Interested on account of the strategy of self-defense, we have worked our way to this commanding position. With only one war, that with Spain, we have achieved this prestige. Mostly it has been acquired by tactful diplomatic advances toward those nations which might have been

considered our rivals, and with friendly assistance to embarrassed little nations which we might have been expected to desire to annex or subdue. Other nations have quarreled among themselves over other areas. They have partitioned Africa. They have clashed over Morocco, bickered over the Soudan, argued over the Persian Gulf, and striven for Egypt. These areas, called by Mr. Walter Lippmann "the stakes of diplomacy," have caused bitter international rivalries. They have set country against country ready for the grim arbitrament of war. In these areas, the "subject peoples" have often been the object of undesired "protection." But, when our influence could be exerted, we have acted otherwise. It is true that when we were engaged in our own Civil War, crippled and handicapped with our own troubles, we were not so dominant. Spain practically seized Santo Domingo and France grasped at Mexico. "In the heart of every patriot of these nations," says a distinguished Dominican, "there is a wound which bleeds when memory recalls the humiliations and exactions endured every time when the protection of the United States weakened or could not be asked or given."

Our final domination, naval and strategic though it is at bottom, has been uniquely achieved. Most moves of this character began with infiltration or peaceful penetration, and ended with the clash of arms. Our supreme power in the Caribbean came upon us almost accidentally through the Spanish War, started sentimentally "for the abatement of a nuisance" and as a result of skillful work by our diplomats we have had no other war from the beginning to what now begins to appear to be practically the satisfactorily settled end of our West Indian adventure.



THE UNITED STATES NAVAL HOME, PHILADELPHIA

By Admiral Albert Gleaves, U. S. Navy (Retired)

IN THE beginning and for fifty years afterwards it was called the Naval Asylum, then the name was changed to Naval Home, which was considered more appropriate than asylum. As late as the eighties the sailors spoke of it as the White House.

Before the Revolution the site of the Naval Home was known as the Pemberton plantation; it embraced some 500 or 600 acres on the east bank of the Schuylkill between South Street and Gray's Ferry. On the opposite shore was the little village of Hamilton.

After the battle of Germantown and the occupation of Philadelphia by the British, General Howe selected for his headquarters a house on High Street between Fifth and Sixth. The Chief of Artillery, General Pattison, chose the Pemberton mansion. One day a squadron of troopers galloped up to the gates of the plantation and commandeered it in the name of the King. The owner, James Pemberton, a Quaker, had been deported to Virginia as a suspect, and his wife was alone in the house at the time. She was a determined person and protested vigorously, threatening the soldiers, and vowing she would not give up her home. Madame Pemberton trying to hold up the British Army single-handed is like Mrs. Partington sweeping back the Atlantic tide with mop and broom. Later, however, she softened and consented to sell vegetables out of her garden to General Pattison and his staff, but the Hessians made free with her potatoes and cabbages.

After the British evacuated the city and the Congress renewed its session in Carpenter's Hall, Alexander Hamilton lived in the house and wrote several famous state papers there. Subsequently, the residence was converted into a naval hospital, and old records show among the names of the sick: Farragut, Porter, Major Twiggs of the Marines (who was killed at Chapultepec), Levy ("the American Dreyfus"), Bainbridge, and Hull. It was an ideal place for a hospital; with broad lawns sloping to the river, trees and flowers. On the site of that hospital, the governor's house, built in 1844, now stands.

The origin of the Naval Asylum dates from 1799 when an act of Congress provided a hospital fund to which all seamen, government and merchant, were required to contribute twenty cents monthly out of their pay. In 1811 an act directed this money be turned over to a board of commissioners of Navy hospitals. The War of 1812 intervened and it was not until 1826 that the commissioners recommended that a naval asylum be established, to be located in Philadelphia.

Dr. Thomas Harris, a distinguished and prominent surgeon in the Navy, who had served with Jacob Jones in the *Wasp* and James Biddle in the *Hornet* when she captured the *Penguin*, was ordered to collaborate with William Strickland, the eminent architect, in the selection of a site to be purchased, and the planning and construction of an asylum. This resulted in the purchase of about twenty-five acres of the Pemberton estate for which over $16,000 was paid. Not much interest was taken in the proposal, and work progressed slowly; it was not until 1827 that the cornerstone of the present building was laid.

The asylum consists of three structures, separated from each other, yet forming one entire plan, the main building and the residences of the governor and surgeon. The main or principal edifice is three stories in height, built of Pennsylvania marble, and presents a front of 380 feet, including a center building 142 by 175 feet; it is embellished with a handsome portico of eight columns of the Ionic order. The wings contain verandas on each story. The total cost was about $276,000.

On the occasion of the cornerstone laying,

Commodore Bainbridge said in his dedicatory speech:

> A home will be established for the faithful (seaman) who has been worn out or maimed in fighting the battles of his country. A comfortable harbor will be secured where he may safely moor, and ride out the ebb of life free from cares and storms, by which he has been previously surrounded.

The asylum was not ready for occupancy until 1831, when the building was opened with four regular inmates. In 1834 Lieutenant J. B. Cooper, a veteran of the War of 1812, was assigned as superintendent and the asylum became an adjunct of the navy yard.

When the Naval Home was built it was in the country. Now the city has grown around it, but as its broad acres lie off the beaten highway comparatively few, even old Philadelphians, know of its existence. Most people passing by the high red walls, over which hang elm, maple, and plane trees, catch a glimpse through the iron gates and hedges of the stately building, probably think it is either an insane asylum or a jail, and pass on without further thought, unmindful of its unusual historical interest.

There are fine walks and flowers in the park; a ship's bell, striking ship's time, from the cruiser *Philadelphia*, to which Philadelphia children contributed their silver coins two score years ago; brass howitzers of Civil War period, and a 12,000-pound wood-stock anchor. These are spectral reminders of the old Navy and impart an inspiring sea atmosphere to the place. There are also a number of small brass cannon from the battlefield of Brandywine, and carronades captured from the *Cyane* and the *Levant* by Charles Stewart, the last of the old sea lions. In the portico are two colossal stone balls brought from the Dardanelles in the *Constitution* in 1838 and presented by Commodore J. D. Elliott, the stormy petrel of his day, who now rests in the cemetery at Mount Moriah, which is an appanage of the naval home. The figurehead of the old frigate *Franklin* of 1815 has recently been obtained from the Naval Academy and placed in the grounds. It is a bust of Franklin of fine workmanship by Gerrish, but has been erroneously attributed to William Rush, the celebrated wood-carver. Rifles, boarders' pikes, cutlasses, and ship models adorn the walls of the assembly hall. There is also a tablet of the governors hung in the hall inscribed with their names; on the list are names famous in the War of 1812, Civil War, and the war with Spain.

Affairs at the asylum did not prosper at first; there were complaints and recriminations, so in 1838 Commodore James Biddle was selected to take charge with the title of governor, which the Secretary of the Navy wrote "would add to the dignity of the station and at the same time would sustain no diminution of your own." In changing the title the secretary probably had in mind the naval hospital at Greenwich. He probably could not have appointed a more able man. It may be noted here that Biddle originated what is now known as "Reports of fitness of officers."

Commodore Biddle was a brilliant officer, whose professional standing was very high; he was energetic, kind, and sympathetic; his great reputation, won in action on the quarter-decks of the *Wasp* and the *Hornet*, gave the institution a prestige and importance which had been wanting from its inception. His tour of duty lasted four years, which were the formative years of the asylum. When Biddle assumed charge it was removed from the jurisdiction of the commandant of the navy yard, and became an independent command. Various improvements were suggested and carried out.

In the bitter winter of 1836-37 many old trees in the grounds were cut down and used for fuel. Dr. Shippen says "this was much deprecated, but in the end it was productive of good for it led to the planting of the noble trees now adorning the grounds. These for the most part were planted as mere switches by Commodore Biddle in 1838-40."

It was in Biddle's time that the midshipmen who were under instruction on board receiving ships at New York, Boston, and Norfolk were brought to Philadelphia and a naval school established at the asylum. To this end, a class of a dozen or so was formed, and two professors were employed to instruct them in mathematics and the languages; these were Professor Chauvenet, so well known to midshipmen of a later date by his trigonometry, and Professor McClure. The scheme was not altogether a success. The young men were older than those now admitted to the Naval Academy and nearly all had been to sea. They were restive under school discipline; some of them drank red liquor and "Frenched," and

once, when a chief of bureau incurred their dislike, they hung him in effigy at the truck of the flagstaff. In 1844 a duel was fought by two midshipmen at Burlington, one of whom was seriously and painfully wounded in the face. The other combatant was the late Rear Admiral Rhind, who lived to distinguish himself in the Civil War, and was at one time governor of the home. Altogether sixty-five midshipmen were under instruction at the school until 1844, when it was transferred to Annapolis. Many who attended the school became well known in the Civil War; John L. Worden, the hero of the *Monitor,* Napoleon Collins, who captured the *Florida* in Bahia, Rhind, Trenchard, John Downes, Fairfax, and Jonathan Wainwright, who was killed in action.

Of the early governors, Biddle was *facile princeps.* He was a man of marked culture and evidently was much beloved and respected. His portrait by Sully shows a countenance indicating a severe will and great firmness but withal kind and genial. Upon the detachment of a number of midshipmen who were ordered to sea under Commodore Stewart, they addressed a letter to the governor, a thing now forbidden by Navy regulations, but which reflected the esteem in which he was held:

United States Naval Asylum
Philadelphia, July 9, 1840

The Gentlemen recently attached to this Institution, on leaving, take this opportunity of expressing their high sense of gratitude and respect to Commodore Biddle for his many acts of kindness towards them during the period they were under his command; and entertain the hope that at some future time, they may again have the honor of serving under so distinguished a Commander. With sentiments of high consideration, we have the honor to remain Commodore Biddle's obedient servants. . . .

In the old letter-books are found names that were once familiar in every ship of the Navy, but are rarely heard of today, a fate common to all. It is probable that there is not a wardroom today that has ever heard of Captain John Percival; and yet in his day no one was better known than this eccentric character, "Mad Jack Percival," whose reputation outlived him many years, and of whom countless stories were told. There are hosts of others too, such as Warrington, Shubrick, Foxhall Parker, Bolton, Stockton, Gwinn, to mention only a few. "Each abode his destin'd hour then went his way." It is a temptation to digress and write down some of the old sea stories connected with these names. Some day perhaps this may be done, and what a saga of the sea it will be!

The question is often asked if the beneficiaries relinquish their pensions when admitted. Yes, at first but not now. A beneficiary retains his pension, or retired pay, and as he has no expense he is enabled to build up a neat bank account. If a beneficiary has neither pension nor retired pay he is allowed $3.00 pocket money monthly. He is generously taken care of; has his own room, excellent food, and ample allowance of clothing, medical and dental attention, heat and light. The library in the assembly hall contains 5,000 volumes of reference, history, and fiction. There are motion picture shows three times a week and during the winter months vaudeville entertainment is furnished by the welfare associations. In suitable weather there are holiday excursions on the river or in the country.

There is a pretty custom at the home at Christmas. The beneficiaries provide a tree, presents of shoes, sweaters, stockings, woolen caps, and gloves, etc., as well as toys and a spread for poor children of the neighborhood, who look forward yearly to this entertainment. The late Bishop Partridge once said in a sermon in Shanghai, "a sailor-man is the tenderest hearted creature God ever breathed the breath of life into." This is true, as is shown not only at Christmas, when the beneficiaries become hosts to about two hundred children, but also by their generous contributions to the relief of the poor and needy. They contribute annually to the Navy Relief fund, and at a recent call from the welfare federation the beneficiaries contributed nearly $500.

There are no punishments. The word is taboo. A few days restrictions are sometimes authorized for minor offenses, but a second violation of the liquor regulations of the home within a year is followed by dismissal. In the old days there was a good deal of drinking among the beneficiaries. It is not so now. When Lieutenant A. H. Foote (afterwards rear admiral) was executive officer in the early forties, he induced many of the old pensioners to sign the pledge and thus conditions were greatly

improved. This was really the beginning of his well-known temperance work in the Navy, and it was he who was largely responsible for the abolition of the grog ration.

The keynote of discipline at the home was sounded in 1842, by the Honorable A. P. Upshur, Secretary of the Navy, in a letter to Commodore James Barron:

> The mildest and most forbearing course seems to be the most proper toward men in the decline of life and who have devoted their best years to the service of their country. This it is well known accords with your feelings, and the Department relies with entire confidence in those feelings on the sound judgment and discretion by which they will be controlled. Expulsion from the asylum should be the last resort.

The idea of a naval home for veterans connotes long service, old age, or disablement from wounds and other injuries incurred in line of duty. This is not necessarily so, because the requirement of twenty years previous service has not been enforced for several years. In view of the recent World War it would not be practicable. The average age of the beneficiaries now at the home is sixty-two; the oldest is ninety-one, and the youngest twenty-four. Nearly all the Civil War veterans are dead; a few Samoan survivors are still left; the majority of the men now on the rolls (233 in all) served in the Spanish War.

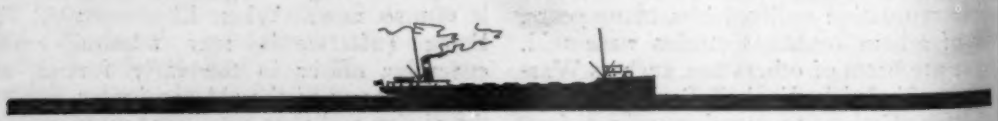
The oldest men, of course, have had a wide experience in peace and war, and in all parts of the world, but like all men who have done things, they are reserved and reticent and do not like to talk about themselves. They are a fine-looking body, and at the monthly muster, in the assembly hall, when all hands appear in their simple uniforms and medals, these elder ship men make an impressive and eloquent picture, dignified by the white hair of many, and the crutches and canes of those who cannot walk without artificial aid.

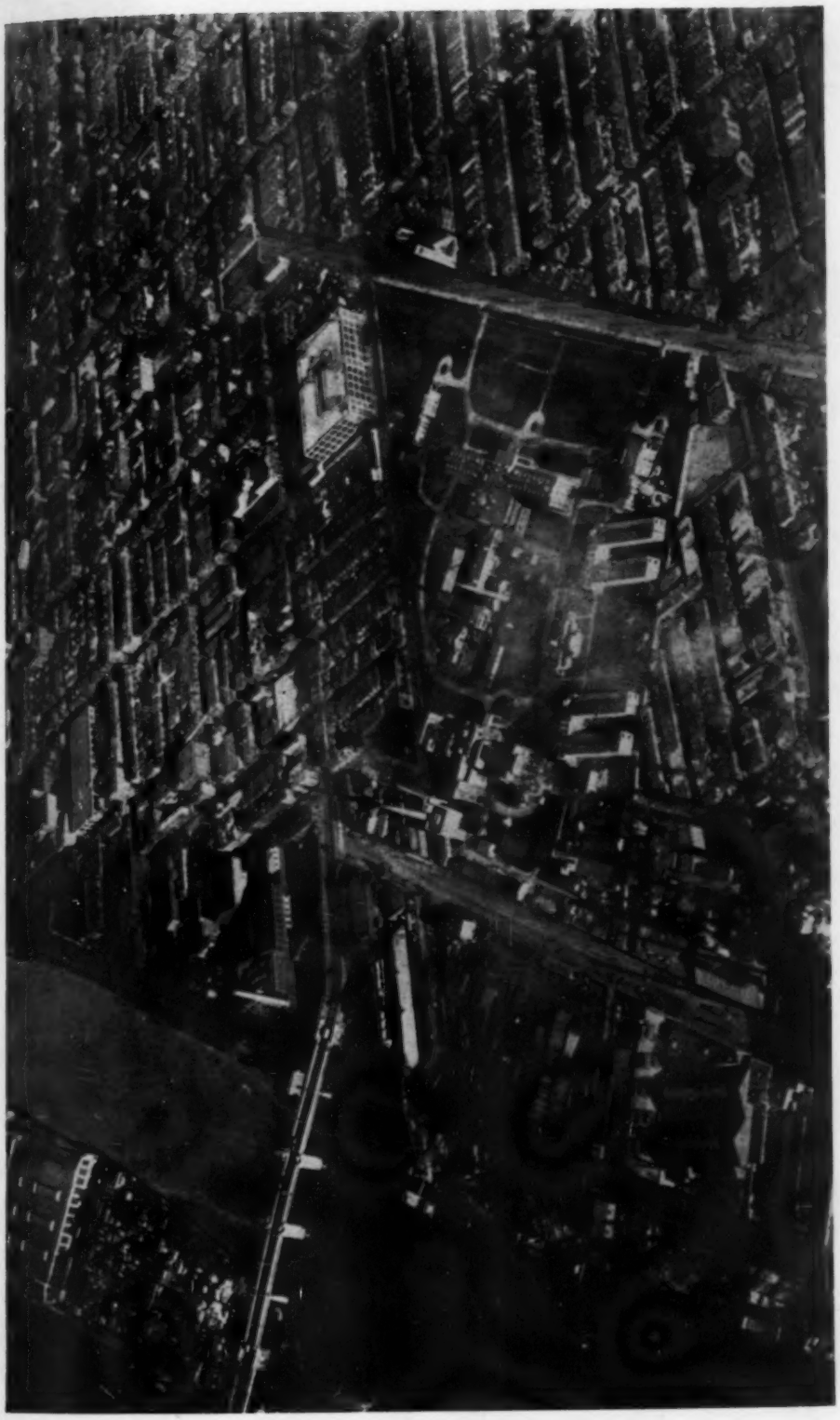
Recently there died at the home a man at the age of ninety-three; he had served in the Civil War; his father fought in 1812, and his grandfather was one of the Boston Tea Party in 1774. Thus the span of three lives reaches back to Bunker Hill. In 1851 a man died in the home who was the last of the crew of the *Bonhomme Richard*. He was one of the two men who assisted John Paul Jones to lash his vessel to the *Serapis* in that memorable engagement off Scarborough Head. At the same time there were two others who were in Perry's barge when he shifted his flag to the *Lawrence* at the Battle of Lake Erie. One of the oldest men in the home today is over ninety; he was at Hampton Roads and witnessed the action between the *Monitor* and *Merrimac*. In the early fifties a man was admitted who had fought under Hull when the *Constitution* defeated the *Java;* he had scars of seven wounds received in that fight.

Another man now in the home, a native American, who lived in England when a boy, served first in the British Navy and when our Civil War broke out he returned to the United States and fought four years in the federal Navy. He went back to England and enlisted in the British Army and was a non-commissioned officer in the Abyssinian Campaign in 1867, and for bravery on the field was commissioned a second lieutenant by General Napier (afterwards Lord Napier of Magdala). Subsequently he quarreled with an officer at mess, challenged him to fight a duel, and killed him. For this he was broken by general court-martial and reduced to the ranks; he was transferred to South Africa and took part in the Ashantee War. At the end of his enlistment he returned to the United States and again enlisted in our Navy.

In 1843 the body of Commodore David Porter was brought to Philadelphia from Constantinople in the brig *Truxtun*, and was buried at the foot of the flagstaff in the grounds, but was afterwards removed to Woodland cemetery in West Philadelphia, the first person to be buried there.

Here "the sailor is home from the sea," without care and without worry, and nothing to do except to await the inevitable turn of the ebb tide.



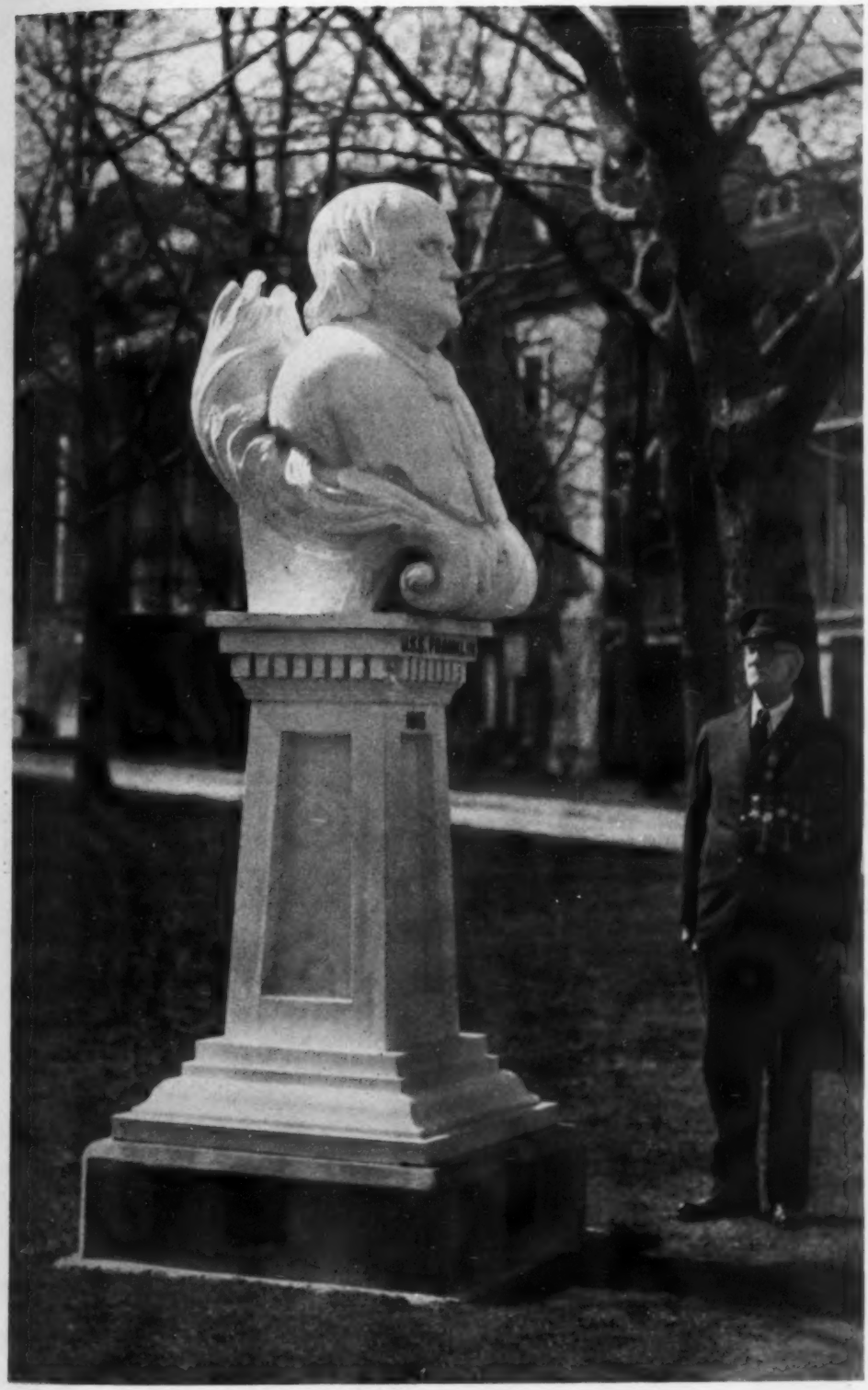


AN AIRPLANE VIEW OF THE NAVAL HOME

Courtesy Admiral Albert Gleaves, U. S. Navy (Retired)

Courtesy Admiral Albert Gleaves, U. S. Navy (Retired) *From a portrait by Sully*

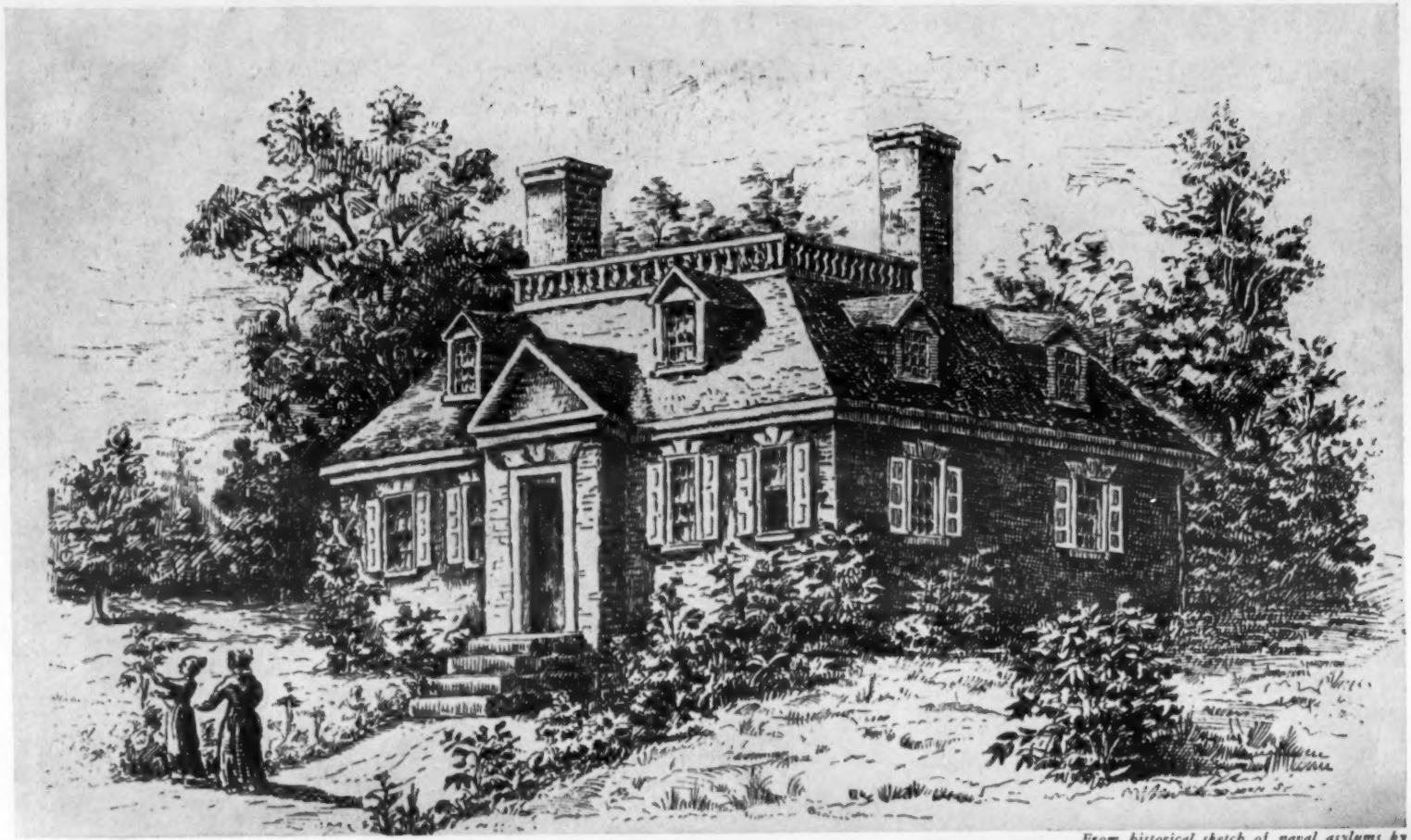
COMMODORE JAMES BIDDLE, FIRST GOVERNOR OF THE NAVAL HOME



Courtesy Admiral Albert Gleaves, U. S. Navy (Retired)

IN THE GROUNDS OF THE NAVAL HOME

The veteran shown is the one mentioned in the text as having killed a brother-officer in a duel.



Courtesy Pennsylvania Historical Society

From historical sketch of naval asylums by Medical Director Shippen, U. S. Navy

"THE PLANTATION"
Pemberton's site of the Naval Asylum.

Courtesy Pennsylvania Historical Society

"THE PLANTATION"
Pemberton's site of the Naval Asylum.

From historical sketch of naval asylums by Medical Director Shippen, U. S. Navy

Courtesy Admiral Albert Gleaves, U. S. Navy (Retired)

VIEW OF NAVAL ASYLUM, PHILADELPHIA, 1853

From "Frank Leslie's Weekly," 1853

Courtesy Admiral Albert Gleaves, U. S. Navy (Retired)

THE PARK, NAVAL HOME

Photograph by Lieutenant William Hartenstein, U. S. Navy

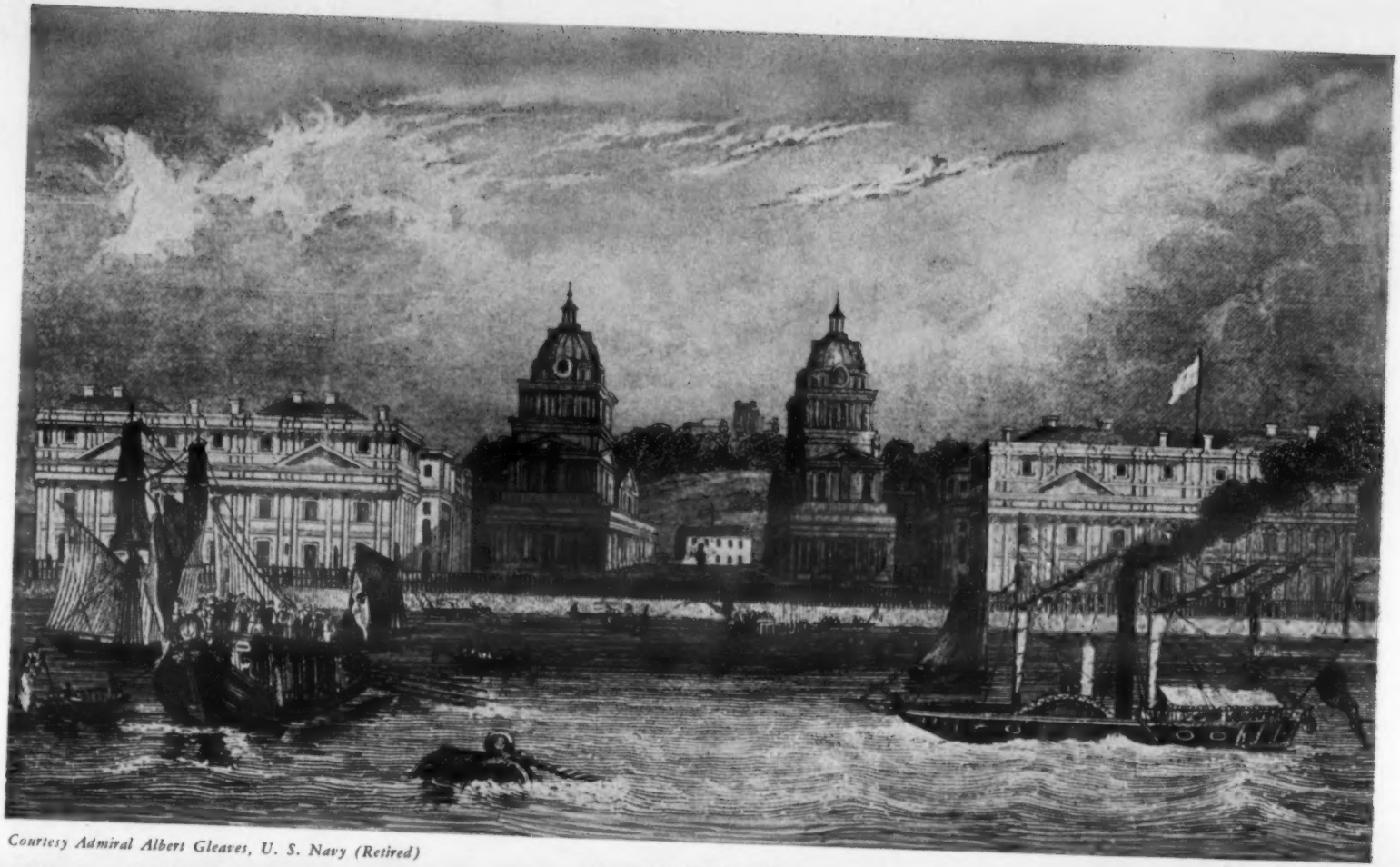
Courtesy Admiral Albert Gleaves, U. S. Navy (Retired)

THE PARK, NAVAL HOME

Photograph by Lieutenant William Hartenstein, U. S. Navy

Courtesy Admiral Murray, R.N.

AIRPLANE VIEW OF THE NAVAL HOSPITAL AT GREENWICH, ENGLAND



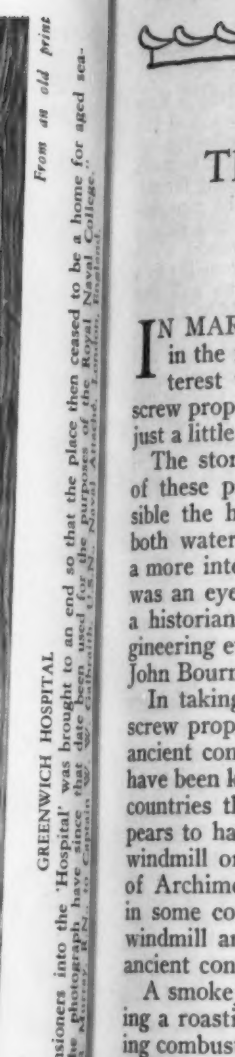
Courtesy Admiral Albert Gleaves, U. S. Navy (Retired)

GREENWICH HOSPITAL

From an old print

"In the year 1869 the system of receiving pensioners into the 'Hospital' was brought to an end so that the place then ceased to be a home for aged seamen, and the buildings seen in the photograph have since that date been used for the purposes of the Royal Naval College."

Letter from Sir Oswyn A. R. Murray, R.N., to Captain W. W. Galbraith, U.S.N., Naval Attaché, London, England.



From an old print

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Courtesy Admiral Albert Gleaves, U. S. Navy (Retired)

THE EARLY HISTORY OF THE SCREW PROPELLER

By Commander H. F. D. Davis, U. S. Navy

IN MARVELING at the progress made in the field of transportation it is of interest to note that the first successful screw propellers for ships were put into use just a little less than one hundred years ago.

The story of the successful introduction of these propellers, which now make possible the high speeds of modern ships of both water and air, can hardly be told in a more interesting way than by a man who was an eye witness and who made himself a historian of some of the important engineering events of those times; accordingly John Bourne[1] will be quoted at length.

In taking up his story he writes: "The screw propeller is, in all probability, a very ancient contrivance. In China it is said to have been known for ages; but in European countries the idea of a screw propeller appears to have been derived either from the windmill or smokejack, or from the screw of Archimedes—an instrument much used in some countries for raising water. The windmill and smokejack both appear to be ancient contrivances."

A smokejack, is "A mechanism for turning a roasting spit: operated by the ascending combustion gases in a chimney."

James Watt's successful steam engines had stimulated the development of means for propelling ships; the earliest thoroughly successful application, using paddle wheels, being that of Robert Fulton in the *Clermont* which made her epoch-making trip up the Hudson on August 7, 1807.

After recounting the probable very early history of the windmill and smokejack, Bourne takes up the more modern developments. Of interest to navigators of today is an invention of Robert Hooke, a prolific inventor of those times:

> On November 28, 1683, Hooke showed to the Royal Society an instrument he had contrived and shown to some of the members twenty years before, by which the way of a ship through the water, or the velocity of a river, could be measured. This instrument, of which the most essential part was a screw turned by the water, was designed, not merely to keep account of the distance run, but also of the amount of leeway under all the tackings of the ship. Only the vane or fly of the instrument was shown to the society and it appears to have constituted the original of the patent or Massey's log, now coming into use; but Hooke's instrument was more perfect than the present patent logs, as it took cognizance of the leeway. Hooke had also, it is understood, discovered a method of enabling his log to take cognizance of ocean currents, which no existing instrument can do; and he is also said to have discovered a method of constructing an instrument capable of tracing upon a map or sheet of paper the course of a carriage on a road, whatever windings it might make: but these with many of his other inventions are now lost.

From Hooke's time until 1836 when Francis Pettit Smith on May 31 took out a patent "for an improved propeller for steam and other vessels" and John Ericsson on July 13 took out a patent "for an improved propeller applicable to steam navigation," there were many proposals put forward. Many of the mechanisms were to operate like a duck's foot or the tail of a fish; others consisted of screws and paddles in various arrangements and locations relative to the ship; water jets and air jets were the basic ideals of others.

John Bourne sums up the situation in 1836 as follows:

> Many of the early plans I have described were susceptible of beneficial, practical application. Several of them, in fact, were tried. Nevertheless, up to the time at which Smith and Ericsson appeared, no permanent or practical progress had been made in screw propulsion.
>
> In 1836 when their patents were taken out, no vessel was in existence which was propelled by a screw. Experiments, indeed, had been made both in this country, in America, and in France, showing that by means of a screw, a vessel might be propelled through the water. But the recollection of these experiments had, in great measure, died out, and what remained of it operated rather as

[1] *Treatise on the Screw Propeller*, Second Edition, 1867. The first edition was published in 1852.

a discouragement than a provocative to enterprise, since it carried the presumption that, if the mode of propelling by screw, when tried, had been found satisfactory, it would not subsequently have been relinquished.

After mentioning the names of several men who had met with some success, notably Lyttleton, 1794, Shorter, 1802, Stevens, 1804, Bourdon, 1824, Brown, 1825, and Waddell, he adds in a judicial tone that "these inventors appear to have been deficient in that persistency of effort which is the main requisite of progression, and probably, too, circumstances had not ripened sufficiently, at the time they worked, to enable such a quality to produce its natural results." Finally:

Whatever theory, however, we may form upon this subject, it is at least certain that up to the time at which Smith took up the subject in this country, and Ericsson in America,[2] no practical progress in screw propelling had been made; whereas, since that time, and mainly in consequence of their successes, the progress of the art has been rapid and uninterrupted. I take no account in such a retrospect of small questions of detail. I do not think it necessary to ask whether the particular propellers, by which this revolution in the art of steam navigation was accomplished, were better or worse intrinsically than other propellers, whose existence had been limited to paper or to the sphere of Polytechnic toys or ineffectual experiment. It does not appear to be a reasonable expectation, that the best possible forms of screw should be those which were first practically applied, and it was a fair presumption that better forms than any known in the infancy of the system should afterwards be discovered. But as such a discovery could not diminish the credit due to Messrs. Smith and Ericsson for having practically introduced this new method of propulsion, so neither should it diminish the emoluments properly accruing from their successful exertions.

This pronouncement was evidently an effort to settle, at least to a degree, the controversy which raged for many years throughout the world, over the question as to whom credit was chiefly due in this matter. It is evident from the foregoing that the early history of the screw propeller is bound up in the life histories of the two main personages, Francis Pettit Smith and John Ericsson, and their associates and that the stories of these two men will be somewhat parallel with possible points of contact. The further history will be given in two parts, English, centering around Smith, and American, centering around Ericsson.

[2] It should be noted that Ericsson's first work was done in England.

Francis Pettit Smith and the Screw Propeller

Francis Pettit Smith was born at Hythe in Kent on February 9, 1808. He was the only son of Mr. Charles Smith, the postmaster of Hythe for upwards of forty years, and when he grew to man's estate he adopted the business of a grazing farmer. He had all his life been addicted to the construction of boats and had contrived and tested various modes of propulsion; but in 1834 a model which he had constructed, and which was propelled by a screw driven by a spring, answered so well that Mr. Smith concluded that a screw would be a better propelling instrument than paddles and he thereupon entered upon the course of experiment and demonstration which ended in the general introduction of the screw as a propeller. During this time I was an attentive observer of Mr. Smith's proceedings, but I only became personally acquainted with him in 1843 when the scepticism of the engineering community had already been shaken by his successes.

Smith in the spring of 1836 obtained the assistance of a banker, Mr. Wright. Even in those days a banker appears to have been very necessary to the success of an enterprise. The model boat, with a wooden screw, was exhibited in operation upon a pond at Smith's home, and "at the Adelaide Gallery in London. At the latter place it was inspected by Sir John Barrow, then secretary of the Admiralty, and an offer was made by Messrs. Harris and Bell, of Alexandria, to purchase the invention for the Pasha of Egypt, but this offer was declined."

Next a boat of "six tons burthen" and six horsepower was built, and exhibited in operation on the Paddington Canal and the Thames after November 1, 1836, and in 1837. The wooden screw at first had two turns, an accident in February, 1837, serving to indicate that the length could be reduced to advantage. Having struck a submerged object which knocked off about one-half the screw, it was noticed that the boat immediately speeded up and gave better results.

In order to demonstrate seagoing qualities, even in a boat so small, a voyage was made in September, 1837, touching at the following places in turn: Blackwall, Gravesend, Ramsgate, Dover, Folkestone, Hythe, Folkestone; returning to London on the twenty-fifth " in weather so stormy and boisterous, that it was accounted dangerous for any vessel of so small a size to put to sea."

The courage of the undertaking and the unexpected efficiency of the propeller, rendered the little vessel during this voyage an object of much

interest; and her progress was watched with solicitude from the cliffs by nautical and naval men, who were loud in their praises. These favorable impressions reached the Admiralty and produced a visible effect there. In March, 1838, the Lords of the Admiralty requested Mr. Smith to have the vessel tried under their inspection. Two trials were accordingly made, which were considered satisfactory; and thenceforth the adoption of the propeller for the naval service was deemed a not improbable contingency.

Before finally deciding, however, upon the adoption of the propeller, the Lords of the Admiralty considered it desirable that an experiment should be made with a vessel of at least 200 tons; and Mr. Smith and the gentlemen associated with him in the enterprise, accordingly resolved to build the *Archimedes*. This vessel, of 237 tons, designed by Mr. Pasco, laid down in the spring of 1838, was launched on the eighteenth of October following, and made her first trip in 1839. She was fitted with a screw of one convolution which was set in the deadwood, and was propelled by two engines[1] of the collective power of eighty horses. Her cost was 10,500 pounds. She was built under the persuasion that her performance would be considered satisfactory if a speed was attained of four or five knots an hour; and that in such an event, the invention would be immediately adopted for the Navy. Nearly twice this speed was actually obtained. After having made various trials on the Thames and at Sheerness, the *Archimedes* on May 15, 1839 proceeded to sea. She made the trip from Gravesend to Portsmouth, under adverse circumstances of wind and water, in twenty hours. At Portsmouth she was tried against the *Vulcan*, (paddle wheels), one of the swiftest vessels in Her Majesty's service. The trial took place before Captain Crispin, Admiral Fleming, and other competent authorities who acquired from the result a very high opinion of the efficiency of the screw as a propeller, and this opinion they expressed in writing to Mr. Smith. These successes were achieved by a screw of one complete convolution. . . .

Because of an accident to her boilers the *Archimedes* soon had to be returned to London for new boilers. Repairs consumed five months, at the end of which time, upon the request of the Dutch government, the *Archimedes* was ordered to Texel. On the way a crankshaft broke, necessitating a return to England. In the course of the repair work then taken in hand "the form of her screw was altered, by dividing the one whole turn into two half turns, which, being placed on the opposite sides of the axis, gave to the propeller the character of a double-threaded screw of half a turn."

Further tests were made in 1840 in the course of which the *Archimedes* circumnavigated Great Britain, being shown in the important ports, and then made a voyage to Oporto in sixty-eight and one-half hours. Later she visited Antwerp, Amsterdam, and other places on the continent.

In 1840 and 1841 the first screw-propelled merchant vessels using the Smith system were built. The *Princess Royal* at Newcastle, the *Margaret* and the *Senator* at Hull, and the *Great Northern* (1,500 tons) at Londonderry.

In 1841 the *Rattler* (880 tons), first screw-propelled vessel of the British Navy, was laid down. In 1843, 1844, and 1845 extensive trials were carried out with the *Rattler* in the course of which different forms of propeller were tried, one with the length of the screw equal to about one-sixth convolution being found to give the best results. These experiments thus led to the modern form of screw propeller.

The performance of the vessel, the *Rattler*, was found to be so satisfactory that the Lords of the Admiralty ordered twenty vessels to be fitted with the screw under Mr. Smith's superintendence. The screws introduced into these vessels were in every case double threaded screws, set in the deadwood, after the fashion adopted in the *Archimedes* and the *Rattler;* and the whole of the screw vessels built in this country have been constructed upon this original type.

John Ericsson and the Screw Propeller

John Ericsson was born in the province of Vermland in Sweden, July 31, 1803. His father was a mine proprietor, and at the age of seven his mechanical mind was so far developed that he produced original combinations. At ten years of age he already had made mechanical drawings to his own design and models with his own hands. This attracted the attention of the celebrated Count Platen, to whose talents and energy, Sweden is indebted for her magnificient Canal of Gotha—by far the greatest engineering work of the North of Europe, 300 miles long. By the influence of Count Platen, Ericsson was made a cadet in the corps of Mechanical Engineers, and was employed by the Count Platen as leveller and draughtsman on the great ship canal, where he soon gave evidence of his remarkable talents.

In 1826 he constructed an air engine, which was worked with the pine fuel which abounded in Sweden and with which the engine gave good results. But considering that England was the prop-

[1] These engines were geared to the propeller shaft which turned at a higher speed than the engines. All of the early English installations were of this type. Ericsson was, as he wrote in one of his letters, "the father of the direct-acting screw system," which, until the advent of the turbine required gears to reduce the speed of the propeller shaft, became the system universally applied.

er field for the development of such an invention, he came here on May 18 in that year to push his fortune. With the coal fuel used in England, however, the air engine was not found to work well; and Ericsson accordingly now found himself alone in a strange country with an unserviceable invention as his only dependence. His energies, however, were stimulated by difficulty. His brain was his mint. . . .

Before taking up work on the screw propeller he developed a forced draft boiler in which rapid combustion was maintained by means of an exhaust fan; in association with John Braithwaite in seven weeks (1829) he produced a locomotive, the *Novelty*, which made forty miles an hour . . . "still (1866) remembered as a most creditable example of ingenious contrivance, and symmetrical and elegant construction"; then (about 1832) he took up the construction of fire engines.

His propeller patent was taken out in July, 1836, following which time he made experiments with a two-foot long model which

was made to sail round a circular vessel of water, the small engine in the boat being driven by steam conveyed through an upright pipe, which revolved at the center of the vessel, and from whence a tubular arm extended to the engine. The results attained in this way were considered satisfactory, and in 1837 a vessel 45 feet in length, 8-feet beam, and 3-feet draught of water, was built on the Thames, in order to test on a larger scale the merits of the invention. This vessel, which was called the *Francis B. Ogden*, was launched on April 19, 1837, and was tried on April 30 in the same year. Her success was remarkable. She at once attained a speed of ten miles an hour. A schooner of 140 tons was towed by her at the rate of seven miles an hour, and the American packet ship *Toronto* was towed at the rate of four and one-half miles an hour. These experiments were many times repeated with similar success, and during the summer of the year, Captain Ericsson invited the Lords of the Admiralty to inspect the performance of his little vessel. Accordingly, Sir Charles Adam, then Senior Lord of the Admiralty, Sir William Symonds, then surveyor of the navy, Sir Edward Parry, Admiral Beaufort, and other gentlemen of scientific and naval distinction, embarked at Somerset House on board the Admiralty barge, which was then taken in tow by the *Francis B. Ogden*, and the screw vessel with the barge in tow proceeded under steam to Limehouse and back, at a speed of about ten miles an hour.

It may well be noted at this point that Captain Ericsson in this demonstration before the Lords of the Admiralty preceded Mr. Smith by three or four months. The account continues:

Notwithstanding this favorable experiment, Captain Ericsson, from some inscrutable reason, received no encouragement from the Admiralty; and he says that he at length discovered the impediment to lie in an idea taken up by the surveyor of the navy that as the propelling power was applied at the stern, the vessel could not be steered in an efficient manner. It is well known that in the case of paddle vessels which have been lengthened considerably by the bow, it is afterwards difficult to keep them head to the wind, from the propensity they acquire to turn round like a weather-cock, being brought so far astern; and the surveyor of the navy probably thought that in the case of a screw vessel with the propelling instrument at the very stern, this fault would be aggravated in a serious degree. Such a presumption was certainly a natural one at the time; nevertheless it is clear that it was still only a presumption, and the question was one to be settled, not by instinct, but by experiment. If any objection of the kind existed it ought to have been stated in a candid manner; but this was not done, and Ericsson appears to have left this country in disgust, carrying his invention to America. The objection alleged to have been raised by the Admiralty authorities against Ericsson's plan, they could not raise against Smith's; for, before Smith put himself in communication with them, he had proved, by numerous conclusive trials, that his vessel would steer when going head to wind, and any hypothetical objection became untenable when it was confuted by facts which were well established and widely known.

Thus while England lost, America gained, the knowledge, experience, and ability of John Ericsson for the development of screw propulsion; and these circumstances forced parallel developments of the screw propeller in the two countries. Thus also, John Ericsson was forced to go to the country, where, more than twenty years later, his *Monitor* played the leading part in a dramatic and crucial battle in the history of United States, if not of the world. Certainly the battle of the *Monitor* and *Merrimac* sounded the death knell of the then old type of war ship.

In the winter of 1837, a canal boat, called the *Novelty*, was fitted with Ericsson's propellers and was set to ply on the canal between Manchester and London. The propellers were only two feet six inches in diameter, and they were driven by an engine of only ten horsepower; nevertheless the boat realized a speed of eight or nine miles an hour. This is the first example of a screw boat being employed for commercial purposes; but this boat was in a short time laid up owing to the failure of her owners.

At this juncture, Ericsson came into communication with an officer of the United States Navy, Captain Robert F. Stockton, a man of talent, energy, and means. Captain Stockton was so much pleased with the performance of Ericsson's experimental boat, that he ordered an iron vessel seventy feet long, ten feet beam and fifty horsepower, to

be constructed and fitted with the new propeller. This vessel, which was called the *Robert F. Stockton*, was launched at Liverpool in the month of July, 1838, and her first trial took place in the following September. The engines were direct-acting, connected immediately to the propeller.

Later in 1838 and early in 1839 trials of the *Robert F. Stockton* were held in the Thames. "In April, 1839, the *Stockton* left England under the command of Captain Crane, and proceeded under sail to America. In the latter part of 1839, Captain Ericsson proceeded to America, where he has remained ever since."

Ericsson used, in his earlier experiments, and his patent covered the use of, two tandem contrary turning propellers, hollow shafting being used, each propeller built up of eight blades (short axially and about one-third diameter radially) attached at their inner and outer edges to rings, the inner ring being supported from the hubs by a spider the arms of which were much like a modern three-bladed propeller. Thus the Ericsson propeller was practically three bladed from the center outward for about two-thirds of the radius and eight bladed for the remaining third of the radius and except for the supporting members necessary to this arrangement of blades, was much like a modern propeller in its proportions.

In pointing out an early modification of Edicsson's arrangement John Bourne states: "But in one of the trials at which Smith happened to be present, he suggested to Ericsson that he would probably obtain a better performance if he removed one of the wheels. This accordingly was tried, and Smith's anticipation turned out to be correct. The *Robert F. Stockton* was so constructed as to be able to use one wheel or two, as might appear advisable; but Ericsson's general practice since this time has been to use only one wheel."

Upon returning to the United States, Captain Stockton was successful in interesting the U. S. Navy Department in screw propulsion. In 1842 and 1843 the U.S.S. *Princeton*, first screw-propelled ship of the U. S. Navy was built under the supervision of John Ericsson. The engines, as well as the propeller, were designed by him and so arranged as to be beneath the water line and therefore more out of the reach of gunfire. In this feature these engines were the first of their kind, and this example in engine design was soon followed by the French in the 44-gun frigate *Pomone* and by the British in the frigate *Amphion*.

The *Princeton* later made a visit to Europe where she was inspected by representatives of all the leading nations. The design of her engines and armament was so impressive, and her performance was so successful, that interest in such design was greatly stimulated.

Knowing the rewards which now accrue to inventors of a new toy or a dress fastener, it may be of interest to know how the two men who "put over" the screw propeller fared in this respect.

It has been mentioned that Mr. Smith's services were retained by the British Admiralty in connection with the twenty screw propeller installations which were ordered for the British Navy. John Bourne states:

> Mr. Smith, after this initiation had been achieved, retired from the service of the Admiralty, and for some years associated with Mr. Penn, after which he resided for a time in Jersey, and was finally appointed at the instance of Mr. Woodcroft, himself, a screw patentee, to the office of curator of the Museum of Patents at Kensington, which office Mr. Smith still (1866) fills, to the great advantage of the museum and the great satisfaction of the community. Most inadequately, however, up to the present time have his services to the public been requited; and so far his career offers little inducement to others. . . .

Francis Pettit Smith was a farmer whose idea of screw propulsion was apparently an "only child" and when this idea had been "brought up" history records no others. As stated above his invention served to bring him temporary employment and public notice and no other rewards worth mentioning.

John Ericsson, on the other hand, was an engineer, without peer in his time, so absorbed in his engineering studies that he spent twelve to fourteen hours a day, up to the time of his death in 1889, working on the many problems which attracted his attention. As in the case of Smith, the development of the propeller brought few direct rewards to Ericsson. But his propeller, coupled with his other inventions and his outstanding engineering ability, brought him into associations which assured him an income, certainly modest considering his achievements, but which made it possible for him to continue to the end with his work.

NAVIGATION PROGRESSES

By Lieutenant Commander Emile Topp, U. S. Navy (Retired)

NEW systems of navigation were proposed as early as 1514. Perhaps there are records that would make this date B.C., but confining the research to easily accessible publications, one finds mention of John Werner of Nurmberg and other pioneers, whose accumulated efforts we enjoy today.

It should be understood that the old-timers were no experts in navigation. Crude and inaccurate in both method and result was the solution of the latitude problem; longitude was a closed book, and consequently was left alone. Notwithstanding the handicaps, ships somehow or other got from place to place. They did not, to be sure, always arrive at their hoped for destination but, as Columbus so strikingly demonstrated, they did arrive somewhere and that is always something.

In the light of what happened years later, the solution of the longitude problem suggested by Werner is worthy of note. He planned to measure the angle between the moon and some other astronomical body, and thus calculate the time at a given meridian. Comparing this computed time with the local time gave the essentials necessary for a determination of longitude. Many navigators of the present day will recognize this proposition as the problem of lunar distances, or lunars. The sextant, chronometer, *Nautical Almanac*, and even logarithms were unknown in Werner's day, and consequently his idea was of no immediate practical benefit.

Completely reconciled to the idea that the longitude was not to be solved, we find a writer, at about the time of the Spanish Armada, disposing of the subject as follows:

> Now there be some that are very inquisitive to have a way to get the longitude, but that is too tedious for seamen, since it requireth the deep knowledge of astronomy; wherefore I would not have any man think that longitude is to be found at sea by any instrument; so let no seaman trouble themselves with any such rule, but (according to their accustomed manner) let them keep a perfect account and reckoning of the way of their ship.

Another writer of the day dismisses the subject by the frank admission that its discussion embarrasses him.

Feeling that the subject of latitude was not completely exhausted, one Pedro Nunes (Nunez or Nunius) "proposed and solved instrumentally upon a globe the problem of finding the latitude." Pedro of the many names is listed as a cosmographer—going a step further, as an eminent cosmographer—which to save thumbing of dictionaries, means he was well versed in the science of the universe, including astronomy, geography, and geology—in other words, a pretty smart lad.

About the same time that Nunes made his contribution, R. Gemma Frisius suggested "longitude be found by eclipses of the moon and conjunctions reckoned from the Fortunate (Azores) Islands." Latitude he affirmed should be measured from the equator, and not from the ecliptic. Difference of longitude and departure were one and the same thing to him—*how unfortunate to have found him wrong.*

A general lamentation among cosmographers, seamen, and all sort of folks interested in navigation was heard because of unreliable charts. Quite a bit of originality in the design of charts was exercised in those days. For one thing there was keen competition in establishing a prime meridian. One chap suggested that the first meridian be drawn "through the Azores, or nearer Spain, where the chart is not so occupied." Another cartographer, a crank for precision, decided the prime meridian should go through the western extremity of San Michael Island, for the reason the variation at that point is zero, and consequently the meridian would pass through both the magnetic and geographical poles. One cannot be unduly surprised at errors that crept into such charts. London, for example, was 32 minutes off in latitude, and 5 degrees 39 minutes off in longitude; Babylon missed out by 2 degrees 28 minutes in latitude, and 8 degrees 35 minutes in longitude, and this

was a chart, mind you, not a Sunday school map; Madeira registered a slight error of more than 3 degrees in latitude and 4 degrees 20 minutes in longitude.

Naturally things were a bit confused, and improvement was urgent. The answer was the introduction of the Mercator chart. Here the records are a bit conflicting. One authority states that Wright made the discovery of the correct and uniform method of dividing the meridional line and making charts, which are still called after the name of Mercator. Another authority states Mercator, himself, invented the well-known chart which is named for him. Whoever conceived the chart, it is interesting to note that Mercator's name was not Mercator, but Kauffman, its German equivalent.

In 1590 Napier invented logarithms—a pretty story this and something to be figured with for years and years.

Passing over such trifles as the enunciation of Kepler's laws, the invention of the vernier and of the tangent screw, the event of the seventeenth century was the establishment of the observatory at Greenwich in 1675.

Not to run ahead of the story, mention must be given Pedro de Medina, who in 1545 published what is said to be the first book devoted entirely to the subject of navigation. Almost fifty years later, in 1594, Captain John Davis took out sufficient time from his searching for the northwest passage to write *The Seamen's Secrets.* The irony of the title comes to light in the introduction which states the book is written for mariners, and not for the erudite gentry, who from warm fireplaces tell the other fellow how to do the job. In the book Davis described horizontal (plane), paradoxical (traverse), and great circle sailings, and most probably in a very practical way.

The beginning of the eighteenth century still found latitude a favorite subject. In 1728 Nicholas Facio, or J. Nicholas Fatio de Duiller (taking your choice), presented another "last word." Alas, his system was hardly under way when Richard Graham, in introducing a still newer system, said, "his (Facio's) method requires a vast number of computations, and a great deal of skill in spherical trigonometry, it has seldom been made use of, and never but by good mathematicians." Graham's improvement was evidently good. The chronicles say of it: "we may indeed give the latitude within some minutes of the truth with ease and expedition." The loud silence, be it noted, on the subject of longitude continued. In 1740, Cornelius Douwes followed with a set of logarithmic solar tables, published in London, and used extensively.

And now a real bit of history creeps in. In the year 1757 Don Jorge Juan published his *Compedio de Navegacion,* probably the first book for the "special requirements of midshipmen." How that volume has grown into a library.

Louder and louder were the laments over the sadly inaccurate rewards of painfully laborious methods in establishing longitude. The theory of lunars, the same idea that Werner had presented in his day, was recognized as the most probable solution of the problem. Instruments, however, were still inaccurate; such tables as were published were full of errors; attempts to establish longitude by comparing the local compass variation with that given on the charts were recognized as futile. Something had to be done, and that something soon. The English Parliament stimulated things by appointing a commission to take charge of the situation, and by offering prizes for practical improvements in navigation. Biggest of the offers was a bounty of ten, fifteen, and twenty thousand pounds for anyone who would invent a method that would determine longitude at sea within sixty, forty, and thirty miles, respectively. Naturally such prizes were well worth while. The invention of the sextant in 1731, was an impetus to the lunar advocates; the invention of the chronometer in 1735 brought into prominence a new school, who believed longitude could best be solved that way.

Foremost of the chronometer method advocates was a watchmaker, John Harrison by name, who had already invented a clock pendulum which remained at one length regardless of temperature. Making a long story short, he presented a chronometer for trial. Calloused by thousands of trifling schemes presented prior to this time, the prize commissioners had to be shown. So Harrison and his chronometer were put aboard one of the king's ships which cruised to Lisbon. As revealed by this preliminary trial, the device seemed to have some real merit; at any rate it was not bad enough to throw out. Reading between the

lines, Harrison had quite a time of it. The prize was big and the eyes that peered out of the horn rims of the lunar advocates were not without their glint of envy. They just knew no mechanical contraption could possibly solve the problem, and could prove it too with their elaborate mathematical formulas. Their patriotism came to the front, and they offered to save the government any money that might be spent in trying out the instrument by immediately throwing it into the scrap heap. The commissioners, however, were not swayed by these scientific gentlemen. Somehow or other the chronometer looked good to them. Perhaps its theoretical errors might be forgiven, because most people going to sea were mariners and not polished mathematicians. Maybe the practical sailor-man might get his ship into port more regularly if he were given an easier method, and then, too, it might be a good idea to encourage something that would cast off the shroud of mystery on the subject of navigation. Whatever their speculations, they decided to give the chronometer a real trial. On November 6, 1761, William Harrison, son of the inventor, took an instrument (the fourth model Harrison had submitted) aboard H. M. S. *Merlin* and set sail for Jamaica. There is nothing said of radio ticks, nor of the performance of the time ball at Kingston, so the test must have been quite honest. At any rate upon the return of the *Merlin*, on April 2 next, the total accumulated error in Long. was 1′-54″.5—less than one second per day.

The lunar advocates were still not convinced. In spite of the sterling performance of Harrison's instrument, they offered every conceivable obstacle, and tried to prove Harrison a charlatan. Chief in the ranks of the chronometer's opponents was Royal-Maskelyne, an astronomer. It was a day of hearings and rehearings; papers read for the chronometer; papers read against the chronometer; articles proving the lunar distance method to be infallible; articles proving the lunar distance method to be vicious nonsense. When it was all ironed out, however, Harrison was paid the twenty thousand pounds, but the battle was not over.

Maskelyne, the editor of the first English *Nautical Almanac*, and sometimes known as the father of lunars, remained unconvinced. His school swallowed with no grace the bitter pill of Harrison's victory. Further prizes, smaller in amount, of course, than that won by Harrison, were paid for devising shorter methods in juggling with the monstrous form of mathematical gymnastics. Maskelyne, himself, wrote an article on how to find longitude within one degree. Think of the progress that has been made. There was an astronomer royal, famous for his accuracy, proud of an accomplishment like that. What spotter in the fleet couldn't guess the longitude closer than one degree?

Under Maskelyne the lunarists held the whip hand. Determining to discourage the use of chronometers and thus cram their theories down the throats of the seafarers, they made seemingly impossible specifications for any chronometer to meet. As a matter of fact they were not unsuccessful. Lunars were used for years and years. But what they did not expect was that the watch makers would not only meet the rigid specifications, but actually surpass them. The unsportsmanlike tactics of those who planned to ruin any chance of a workable chronometer tended to hasten its perfection.

Greatest of the bevy of navigational writers that appeared late in the eighteenth and early in the nineteenth centuries, was our own Bowditch. The first edition of his *American Practical Navigator* was published in 1802. What he said in that edition is not known to the writer, but as late as the 1906 edition forms and tables for working out lunar distances were in an appendix.

There were thirteen tables, labeled as follows:

No. 1. Mean reduced refraction for lunars.
No. 2. Log A for computing the 1st correction of the lunar distance.
No. 3. Log B for computing the 1st correction of the lunar distance.
No. 4. Log C for computing the 1st correction of the lunar distance.
No. 5. Log D for computing the 1st correction of the lunar distance.
No. 6. Second correction of the lunar distance.
No. 7. (a) For finding the correction of the lunar distance for the contraction of the moon's semidiameter.
No. 7. (b) Same title as 7 (a).
No. 8. (a) Giving argument for table 8 (b).
No. 8. (b) Contraction of sun's semidiameter.
No. 9. Logarithms of small arcs in space and time.
No. 10. Showing the correction required on account of second differences in finding Greenwich time corresponding to a corrected lunar distance.
No. 11. For finding the value of *N* for cor-

recting lunar distances for the compression of the earth.

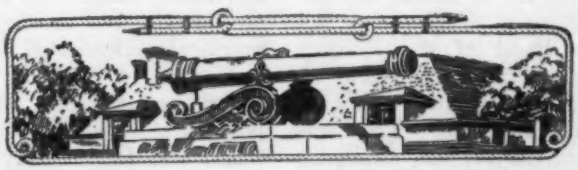
For accurate results, within the degree of accuracy ordinarily possible by the method (a result within 20 seconds of time was considered good), three observers were necessary, and an average of a series of observations had to be used. What a work-out! Lecky wrote the requiem of lunars thus: "But lunars are as much out of date as the caravels of Columbus—*and for a like reason.*"

The ingenious discovery of Captain T. H. Sumner, an American shipmaster, looms as the divide between the old and the new systems of navigation. In daily use by all navigators nothing need be said regarding its efficacy. Lord Kelvin observed, speaking of Sumner's method, "that it would be the greatest blessing to navigators, both young and old, if every other method of ordinary navigation could be swept away." Practice confirms the acceptance of the recommendation. Credited as Sumner is with the discovery of this present-day fundamental by such stellar authorities as Bowditch, Napier, Lecky, Lord Kelvin, and a host of others, is it not strange to find a dissenter? Yet one finds a passage by Captain Robert Martin, British Navy, commenting on Sumner's method as follows: "This is set forth as a novelty but was published by Captain R. Owen, R.N., early in the nineteenth century and practiced by many officers." Be that as it may, the fact remains that Sumner's method has stood the test of sail, steam, and air, and nothing appears ready to displace it.

The more recent systems and practices are more or less confined to expediting the solution for a line of position. A passage, in a standard navy textbook of 1906, stating that the chord method "embodies the present practice of the United States naval service," we find changed in the 1917 edition of the same book. There we find the statement that "the method of Marcq Saint-Hilaire has almost entirely supplanted the time sight." Any applicant for a U. S. Steamboat Inspection Service license will find, however, that the time sight is still a lively corpse.

Strangely enough the "new navigation," devised on the French ship *Renommee* in 1875, by Admiral Marcq Saint-Hilaire, is not as new in conception as the so-called newest systems. An article in the January 1927, PROCEEDINGS of the Naval Institute by Commander Radler de Aquino brings this point out clearly. Lord Kelvin as early as 1871 presented the first table for solution by inspection. His aim was "to abolish calculation in the ordinary day's work" (at sea). The foundation laid by this scientist has been well builded upon. Older cumbersome methods have given way to newer, expeditious ones. A variety of neat solutions have been presented within the past decade, and so strong are the praises of the advocates of the various systems that one may feel satisfied that none are without a full measure of merit.

Nor have the modern improvements been confined to tables and mathematical calculations. Radio ticks, radio bearings, second-setting watches, bubble sextants, navigational slide rules, and countless other mechanical aids testify that the solution of the eternal astronomical triangle keeps pace with the times.



WHY MEN ENLIST

By Lieutenant Commander H. M. Kieffer, U. S. Navy

THE recruiting of men for armies and navies is an ancient business. Although the accomplishments of bodies of men are almost invariably matters of record, the details of the assembling of these bodies seem to have been forgotten in the press of the urgent matters that succeeded organization. Human nature changes very slowly, and the recruiting methods of today are undoubtedly, in their general forms, resurrections of methods used a hundred or a thousand years ago.

There is a constantly recurring tendency to place emphasis on the recruiter rather than on the recruit. We all have heard of one type of recruiter who sees an utterly unknown man walking down the street, and says, "See that man? In fifteen minutes I'll have him signed!" He sallies forth, full of he-man salesmanship, and very probably in fifteen minutes fulfills his boast. Another man is enlisted.

The noticeable thing about such a transaction is the ability of the recruiter. We wonder at his skill, which is akin to hypnotism, as is also the skill of the gentleman who succeeds in inserting his foot into the partly opened front door and finally sells the housewife a vacuum cleaner she didn't want. But the recruit in this case seems an unimportant figure. He is just another check mark on the list. We can deduce one thing about him—either the recruiter *is* more or less of a hypnotist or the recruit is a person very easily swayed.

The recruiting sergeant of fiction, adroitly slipping the "King's shilling" or its equivalent into the hand of the country yokel, personifies a certain impression of recruiting. In other words, an amount of misrepresentation is suspected. This impression arises when the recruit, changing from civil to military life, finds, among a thousand and one novel details, some which had not been explained to him. The first instructor of the recruit is the recruiting agent, and the contentment of the recruit during the crucial first half year of service depends to a great extent upon the thoroughness of this instruction.

Our recruiting campaigns in the past have had a tendency to center on one "appeal," exemplified in a slogan. The appeals usually selected have been those of travel, financial advantage, and education, which latter is sometimes considered synonymous with that of training. In each campaign the other facets of life in the Navy have been hidden in order to show with great distinctness the side embodied in the appeal. What this amounts to is that the recruit's first instruction is one-sided. Also, in recruiting, you get what you ask for. Let us consider several campaigns based on the single appeal.

The "travel" campaign immediately following the World War is a case in point. The writer was present when the course of the campaign was decided. The decision was largely influenced by the advice of civilian experts, to whom the problem presented itself as purely one of extracting a certain quantity of humanity from the national population, and who were only indirectly interested in the adjustment of the recruits after enlistment. Their course of reasoning was: "There is at present a labor shortage which causes all except the very young to obtain extraordinarily high wages in industry. The Navy can expect returns only from an appeal to the eighteen-year-old. What will make the strongest appeal to him? "Travel." So "travel" it was, with elephants, kangaroos, and llamas appearing on posters and in the newspapers to the practical exclusion of any other appeal. As a method of enrolling tourists, it was an unqualified success. The civilian experts pointed with pride to the influx, folded their tents, and faded away. Then the recruits arrived aboard ship.

Their average frame of mind could be expressed by the question, "When do we start for the elephant country?" They were told that they would take a cruise in six

months, or a year, as the case may have been, and that in the meanwhile they would work at firing boilers, at handling great guns, and at keeping a ship in order. Finding that there was work mixed up with this travel, just as there was with life at home, the majority of the recruits became extremely dissatisfied, and a situation arose requiring special handling.

As an example of overemphasis on the subject of pay, the granting of bounties during the Civil War offers material for thought. The Union armies were filled for the first three years by volunteers, actuated by patriotic motives. In 1863 recruiting flagged. It was decided, in effect, to supplement the appeal to altruism by the offer of money. The federal government offered a bounty of one hundred dollars to any man who would enlist, twenty-five to be paid upon enlistment and the remaining seventy-five upon being mustered out. In addition, states and counties were allotted enlistment quotas, and offered additional bounties to men enlisting. This emphasis on money naturally increased the percentage of men enlisting for the sole purpose of obtaining the money; and the percentage of desertions en route to the front rose to such an extent that a special name was coined to designate men who repeatedly enlisted and deserted. They were called "bounty-jumpers." Finally the drawbacks of the bounty system were recognized, and it was succeeded by the draft. Photographs and drawings of recruiting booths during the bounty period show posters displayed featuring money and nothing else, a one-sided appeal. Again the recruiters obtained the type for which they had called.

Occasionally an example of the result of overemphasis on education turns up. One such lad appeared before the writer recently, requesting admission to one of the trade schools open to recruits. His fundamental education was insufficient to permit him to keep up with the work in the school, and he was not selected. He was told of the educational courses and advised which ones to obtain and study, but he was dissatisfied. They had told him they would "learn him something," and he was there to be "learned." He went to sea dissatisfied. A recruiter, by overemphasis, had produced an awkward case for some division officer aboard ship.

No man, in the opinion of the writer, enlists for one specific reason to the exclusion of all others. The applicant is acted upon by a number of impulses, of some of which he is aware, but some of which he either does not recognize or he ignores. In order to investigate this theory, approximately two hundred recruits entering training at Hampton Roads were questioned as to their reasons for enlisting. Each recruit was asked to indicate three reasons. The six hundred answers received indicated that the following percentages could be assigned the reasons behind the average enlistment:

Desire to learn a trade	28 per cent
Desire to travel	22 per cent
Honorable service, the uniform, etc.	19 per cent
Reasons connected with pay, retirement, etc.	9 per cent
Athletics	8 per cent
Liking for the sea	7 per cent
Aviation	5 per cent

It would follow, then, that in talking to the recruit, the recruiter should take pains to mention in such detail as is practicable the entire list. The recruit will show an interest, undoubtedly, in one item of the list, and that item will be his main reason for enlisting; but he should be shown the good points of the others. The recruiter then turns over to the training station a man with a fairly complete, though sketchy, idea of the Navy. He is kept from forming vague ideas of his own which later have to be dynamited out of his head.

The list above is applicable to the recruit himself, and not to his parents. It is an attempt at obtaining a cross section of the mind of the man enlisting at present, who is a pretty good recruit, as recruits go. It is also influenced by the arguments used by the recruiting service, as is shown by the low percentage assigned "aviation." In these days, when Colonel Lindbergh has become to the youth of the country the embodiment of daring and success, it would be only too easy to fill the service with would-be aviators. The "aviation fan" is almost a monomaniac—one recruit who had failed in his flight training begged to be allowed to remain near the planes as mess-cook instead of trying for the Naval Academy as his education warranted—and the recruiting service has learned by experience to use a delicate touch with the "aviation" appeal. Several weeks near an air station causes

20 or 30 per cent of the recruits to request aviation duty.

The desire to learn a trade, together with the desire to continue an education, is implanted strongly in the mind of the present-day recruit. It seems also to have sunk deeply into the minds of his parents. Secretary Daniel's presentation of the Navy as a great school has certainly borne fruit. It is a sound presentation—an unsound appeal will not stand in the recruiting game. It draws an excellent type of ambitious lad, and ensures that our enlisted personnel is constantly working for its own betterment.

There is one item set down on the list which the writer has frequently heard discussed with great heat. That is the one listed as "Honorable service, the uniforms, etc." This is an appeal to altruism, to the higher qualities. In reply to the other appeals the applicant comes forward seeking personal advantage. The recruiter who bases his technique entirely upon that of the commercial salesman, instead of merely borrowing from the salesman where the latter can help him, knows how to appeal only to the more selfish impulses. Altruism as a motive is apt to escape him, and at times he denies its existence. The recruit aids him in this. The adolescent does not wear his heart on his sleeve, and the average recruit, if questioned abruptly as to his patriotism, will become a young stoic a will give an answer calculated to turn y inquiring eye away from his finer emotio In reply to the direct question: "What w your reason for enlisting?" numbers of h answer: "None." In the course of a conve sation, however, it will come out that t uniform had something to do with it, a that he was anxious to be a member of a organization with the history of the Na behind it.

Patriotism is connected with the gregar ous instinct. *Esprit de corps* has a simi lar connection. The appeal to patriotism which at the threat of war becomes all im portant, in peace time seems to the writer t merge with a more directly gregarious ap peal. A blending of a call to patriotism wit a call to join an assemblage of "goodly men" seems to express the idea.

Be that as it may, the weight of 19 per cent assigned to "honorable service"—the patriotic motive—was justified by the fact that approximately 20 per cent of the two hundred men had a record of previous voluntary service in a military organization ranging all the way from that of a quartermaster in the Sea Scouts to that of a corporal in the National Guard. Patriotism, however much decried by various oratorical theorists in these piping times of peace, would still seem to be alive.

ENGINEERING DUTY ONLY

By Commander Albert M. Penn, U. S. Navy

A RECENT circular letter informed the service that the Secretary of the Navy had approved a policy providing for the annual assignment of a limited number of line officers to the performance of engineering duty only. A brief outline of the approved policy was included in the circular letter, and it stated that for years subsequent to 1931 the board to select such officers would probably meet in October. The information that can be conveyed in a circular letter of this kind is, of necessity, limited, and in this instance it is not believed that the service has a sufficiently clear picture in mind of this approved policy and the underlying reasons for its establishment.

The acts approved August 29, 1916, (39th statute, chapter 417, page 580) and May 11, 1928, (Public No. 365-70th Congress) were enacted to meet a definite service need—the assignment of a limited number of experienced line officers, who have demonstrated special ability and interest in marine engineering, to engineering duty only. It is to this group of officers that the responsibility falls of insuring that the Navy keeps pace with the rapid improvements in engineering design. It is necessary that our limited Navy be first in efficient marine engineering. This requires the best design, the best methods of operation, and the best methods of maintenance. To accomplish this objective it is essential that a nucleus of capable minds specialize in engineering design, research, experimentation, inspection, supervision of operation, and in the administration of new construction and of repair activities.

The variety and complexity of engineering installations on men-of-war have increased many fold within the past few years, and a wider, fuller, and more scientific knowledge and training are required than ever before. The trend will undoubtedly continue. The tonnage and other limitations set by the Washington conference, and those that will be the outcome of the London conference, make the problems of design and construction even more difficult. If the United States Navy hopes to design, build, and maintain a better ship on equal tonnage than any foreign navy, it is imperative that the proper number of experienced technical officers of the highest attainments be provided, who, of necessity, must give their entire time and thought to their chosen field of work.

Congress passed the laws that were required to meet this service need. The urgent need that existed in 1916 was taken care of by the selection of a number of officers, during the following three years, for assignment to engineering duty only. During subsequent years no assignments were made until the year 1928, when three were designated.

During the intervening period since the enactment of the law of August 29, 1916, no clear-cut policy has been established and no definite procedure adopted governing the future assignment of officers for engineering duty only. After a careful analysis of the present situation it is apparent that the establishment of a policy and the adoption of a procedure for putting it into effect should no longer be delayed.

In general, the assignment of officers designated for engineering duty only should be to duties requiring special knowledge and experience in engineering. At sea their services are required on the staffs of high commands. Ashore, they are essential for design and other activities in the Bureau of Engineering, for industrial activities at navy yards, for inspection and supervision of new construction at shipbuilding plants, for inspection of naval materials (primarily engineering materials) in the more important districts, and for other special assignments where advanced technical knowledge and an aptitude for research and experimentation are requisite qualifications.

The officers who have and will continue to complete the postgraduate courses in engi-

neering furnish the personnel needed for the efficient operation of the machinery afloat, including engineer officers of the capital ships. They also fill important junior engineering billets ashore in the industrial department at navy yards, in the Bureau of Engineering, as assistants to inspectors of machinery and inspectors of naval material, as assistants at the engineering experiment station, fuel oil testing plant, research laboratory (Bellevue), etc.

On May 29, 1930, the Secretary of the Navy, appointed a board to study and submit recommendations looking to the formulation of a policy regarding officers designated for the performance of engineering duty only.

The report of this board, as approved, is as follows:

1. The board, in compliance with reference (a), has made a study in regard to the needs of the several technical bureaus for engineering specialists. It has held hearings and has had access to correspondence on the subject. It has carefully considered recommendations made by the chiefs of Bueaus of Navigation, Ordnance, Engineering, and Aëronautics, and also by other officers who were considered representative of the service viewpoint. Enclosure (A) and the the exhibits therewith contain a record of the proceedings of the board and of the information available to the board.

Historical

2. The Roosevelt board of 1897 proposed to remedy the evils and jealousies arising from the existence in the same military unit of two separate bodies of officers with separate, yet closely interrelated, duties, each naturally firm in the belief of its own importance, and sensitive to any fancied slight by the other by making the line officer and the engineer the same man, by throwing both corps into one; or in other words to do away with the engineers as a separate corps by requiring all line officers hereafter to possess that knowledge, both theoretical and practical, of steam engineering, and mechanics, which it is absolutely indispensable for the modern line officer to show.

3. The Roosevelt board recognized that the constructing and designing engineers, the men who plan and build the engines, should be detailed for this purpose from among men who have shown special aptitude for the work.

4. In 1899, by act of Congress, the amalgamation of the line and engineer corps was effected. Since 1899 the responsibility for naval marine engineering has been with the line officers. For a number of years they were capably and loyally assisted by officers of the old engineer corps, all of whom have now passed out of active service.

5. In 1909, in recognition of the need of a better preparation in engineering subjects for a limited number of line officers than that provided by the undergraduate courses at the Naval Academy, the postgraduate school was established and now trains about forty officers a year. The postgraduate school has provided a supply of well-trained officers for the important operating billets afloat and for many of the technical and administrative engineering billets ashore, without impairing their prospective value for command.

6. In addition to these postgraduates who pass on to command afloat, it has been found that naval engineering requires for its efficient development a group of specialists who must pursue the subject closely and continuously in order that certain highly technical positions notably in connection with design research and inspection may be adequately filled. These officers, while of the line, are not trained for command afloat.

7. Recognizing this need of specialists, Congress, in 1916, authorized the selection of officers for engineering duty only, and in the following three years, a total of sixty-five were so selected, and carried as extra numbers in the line, for shore duty only, after reaching the grade of commander, except for certain assignments to staff duty afloat.

8. Because of a reluctance to increase the number of such officers, no further selections were made until 1926 when three were designated.

9. This board is now convened for the purpose of making a study and submitting recommendations looking to the formulation of a policy regarding officers designated for engineering duty only under the provisions of the act of August 29, 1916.

General

10. The board, after a study of the subject, believes that the recommendations of the Roosevelt board to transfer the control of and the responsibility for engineering to the line officers of the Navy were, in principle, sound and that our Navy has fared well in engineering as compared with other navies in the thirty years since the amalgamation of the line and engineer corps. In the World War the comparison was favorable to the engineering of our service.

11. The board believes that the operating billets afloat and most of the technical and administrative positions ashore in engineering, should continue to be filled by line officers of engineering training and ability without impairing their value or their prospects for general line duties in command and flag ranks. Modern fleets are concentrations of mechanical power in all its phases, and their effective employment is so complicated that the efficiency of the Navy as a whole requires that every officer be more expert than the average of his fellows in at least one branch of his profession, be it engineering, navigation, communication, ordnance, gunnery, torpedoes, strategy, tactics, or any other. This he can do without sacrifice to his ability as an all-round officer; this he should be required to do; and for it he should receive credit when being considered for promotion, whether his duty be above deck or below.

12. Line officers of engineering ability and experience should be freely available when on shore duty for engineering assignments, even in command rank, to the same extent that officers of ability and experience in ordnance are, without jeopardizing their prospects of promotion.

13. The Bureau of Engineering finds a reluctance on the part of some qualified officers to re-

peated engineering assignments after reaching the rank of lieutenant commander, because of a fear of the effect of such duty on their selection for promotion.

14. It is precisely this condition which has led the bureau to recommend a considerable increase in the number of officers for engineering duty only.

15. Limitation of armaments has imposed certain restrictions on numbers and sizes of ships. It does not limit the education or ability of personnel. To produce a maximum of power within a limited displacement requires a higher order of technical ability than heretofore when there was no limit to the size of a naval vessel. There will result lighter machinery, whose operation and maintenance will be more difficult. In the design of this machinery we are in competition with the technical experts of foreign navies. Thus there is now more than ever a need for skilled specialists.

16. The board is strongly of the opinion that future assignments of the group of officers for engineering duty only should be of officers of high ability, who will bring distinction to the group. It has studied the problem of attracting the desirable type of officer to this duty, and believes that building up the prestige of the group by limiting the selections to a small number of outstanding officers by a board of flag officers will give them the enviable honor of belonging to a select group.

17. There is another reason for limiting the number of selections, that is, to prevent a tendency toward the revival of a corps spirit. It is better that there be loyalty to the Navy as a whole rather than a community of self-interest within the Navy. Which of these conditions may develop will depend largely on the degree of sympathetic treatment of the group by the line of the Navy.

18. If the line is to retain control of engineering, it is essential that competent officers be provided in sufficient numbers in the fleet, the bureau, ship yards, navy yards, in research, and on inspection service. Otherwise, this control will inevitably pass to a technical corps.

19. The foregoing discussion applies to officers performing duty under the Bureau of Engineering. In ordnance and in communications there is as yet no problem. One engineering duty only specialist is assigned to each of these branches, and there is no demand for an increase in this number. This is due to the fact that postgraduate trained officers in these specialties have not the reluctance to repeated duty that exists in the case of the postgraduate officers assigned to duty under the Bureau of Engineering.

20. With aëronautics the problem is acute. Aviation is new and its development has been so rapid and so considerable, involving large expenditures, that there is required in connection with the development and production of material specially trained officers of continuous tenure whose tours of duty may not be interrupted by assignment to service afloat. This need has been met by utilizing naval constructors, simply because no other competent officers could be kept continuously on shore. The work of these officers has been well done, but their continued application to aviation tends to separate them from their corps. The board believes that future assignments of specialists for aviation should be made from line officer graduates of the postgraduate school, where they will have received a course in aëronautical engineering comparable to that given the constructors who have thus specialized. A group of line officer specialists similar to the E.D.O.'s should be formed, for work in and under the Bureau of Aëronautics, and this group should be recruited in part from the naval constructors now under that bureau who are willing to transfer to the line.

Recommendations

21. That the total number of officers to be carried on the Navy list designated for engineering duty only for the branches of engineering under the control of the Bureau of Engineering be a maximum of sixty-six.

22. That of these not more than two should be for radio and sound. It is considered that the apportionment as between other branches such as electrical, Diesel, and mechanical engineers should be determined annually according to the needs of the service and the availability of suitable candidates.

23. That the following principles govern the selection of these officers:

(a) Officers designated for this duty shall have shown exceptional aptitude for and knowledge of engineering machinery, its design and operation. They shall be officers of outstanding ability.

(b) The selection of officers for assignment to engineering duty only will, in general, be restricted to officers of the line who have completed one of the postgraduate courses in engineering. Departure from this rule will be made only in special cases and by unanimous approval of the board of selection.

(c) Ordinarily, officers will be eligible for selection when they have attained the grade of lieutenant commander, and, in general, selections will be limited to the senior lieutenant commanders, within one to five years of the date they become eligible for selection to the rank of commander. Departure from these rules may be made in special cases, by unanimous approval of the board of selection.

(d) The selection from any one Naval Academy class is limited to a maximum of seven. It is desirable that the selections be distributed as evenly as practicable among the Naval Academy classes.

(e) The number to be selected annually is limited to a maximum of five.

(f) The board is restricted only by the maximum number set to be selected. If, in the opinion of the board, there is not a sufficient number of satisfactory applicants, a lesser number will be selected.

(g) Selections will be made annually.

24. That the board for the selection of these officers for E.D.O. consist of three flag officers, namely, the chief of the Bureau of Navigation, the chief of the Bureau of Engineering, and a flag officer from the fleet. (Note: The recommendation in par. 24 was modified. As finally approved, the membership of the board shall consist of one rear admiral and four other officers of, or above,

the grade of commander, nominated for this duty by the Bureau of Navigation. The personnel of the board shall include at least one representative of the interested technical bureau. The report of the board will be addressed to the Secretary of the Navy, via the interested bureau and the Bureau of Navigation. The approved modification in the complement of the board also applies to the board's recommendations in pars. 25 and 26.)

25. That in addition to the foregoing, there be not more than two officers for specialist duty under the Bureau of Ordnance, whose status shall be similar to that of the E.D.O.'s. No selection for this duty should be made until requested by that bureau. The board for such selection should include the chief of the Bureau of Ordnance in place of the chief of the Bureau of Engineering.

26. That in addition to the foregoing, for the aëronautical organization, there be established a group of specialists similar in status to the E.D.O.'s, of a total not greater than——, including the E.D.O.'s and officers of the corps of naval constructors now in the aëronautical organization. That future selection for this duty be made annually by a board of flag officers consisting of the Chief of the Bureau of Navigation, the chief of the Bureau of Aëronautics, and a flag officer from the fleet, from line officer postgraduates not below the rank of lieutenant, at the rate of not more than five a year and not more than five from any Naval Academy class. (Note: The number recommended by the board has been omitted as this number was not approved and the number considered necessary has not yet been set.)

27. That any officers of the corps of naval constructors, now in the aëronautical organization or under postgraduate training in aëronautical engineering, who, upon their own request are recommended by the foregoing board for transfer to the line as specialists in aëronautical engineering, be so transferred, under equable conditions, and that the necessary legislation to this end be enacted.

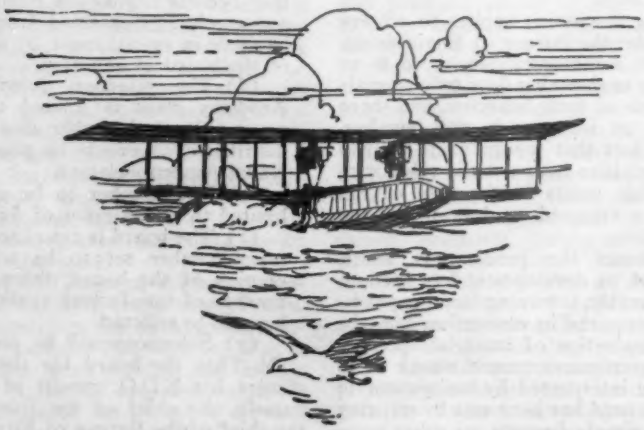
28. That the act approved May 11, 1928, (Pu lic No. 365-70th Congress) be broadened, som what as follows, to provide for engineering speci ists other than those under the Bureau of En neering, and to remove any restrictions as to t nature of their duty:

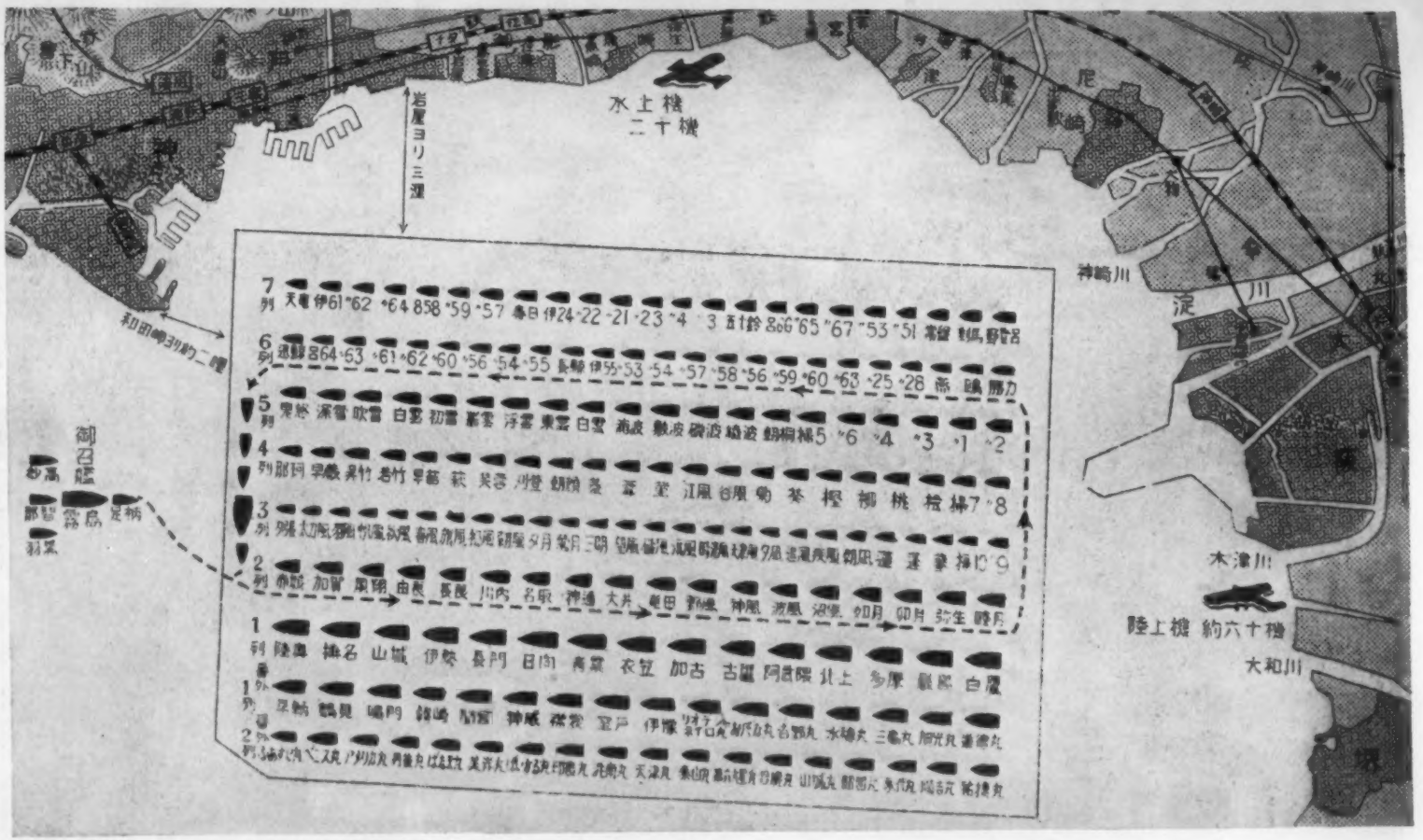
"Officers of the line of the Navy, not bel the grade of lieutenant, may, upon application, a with the approval of the Secretary of the Nav be assigned to engineering duty only, and th when so assigned they shall perform duty as pr scribed by the Secretary of the Navy. Provided That when so assigned they shall retain thei places with respect to other line officers in th grades they now or may hereafter occupy, and als the right to succession to command on shore i accordance with their seniority, and shall be pro moted as vacancies occur subject to physica examination and to such examination in engineer ing as the Secretary of the Navy may prescribe Provided further, That the number of officers a assigned in any one year shall be in accordanc with the requirements of the service as determine by the Secretary of the Navy."

29. That there be freedom of assignment o officers who have been selected for engineerin duty only, as regards continuity of duty on shor and service afloat, to the end that their service may be most effectively utilized, and that they ma be informed of the needs of the fleet.

30. That postgraduate trained engineers wh are not for engineering duty only be encouraged to accept repeated assignments to engineering dut consistent with their development for command afloat, and that to this end boards convened t select line officers for promotion contain at leas one member of experience and sympathetic interes in engineering.

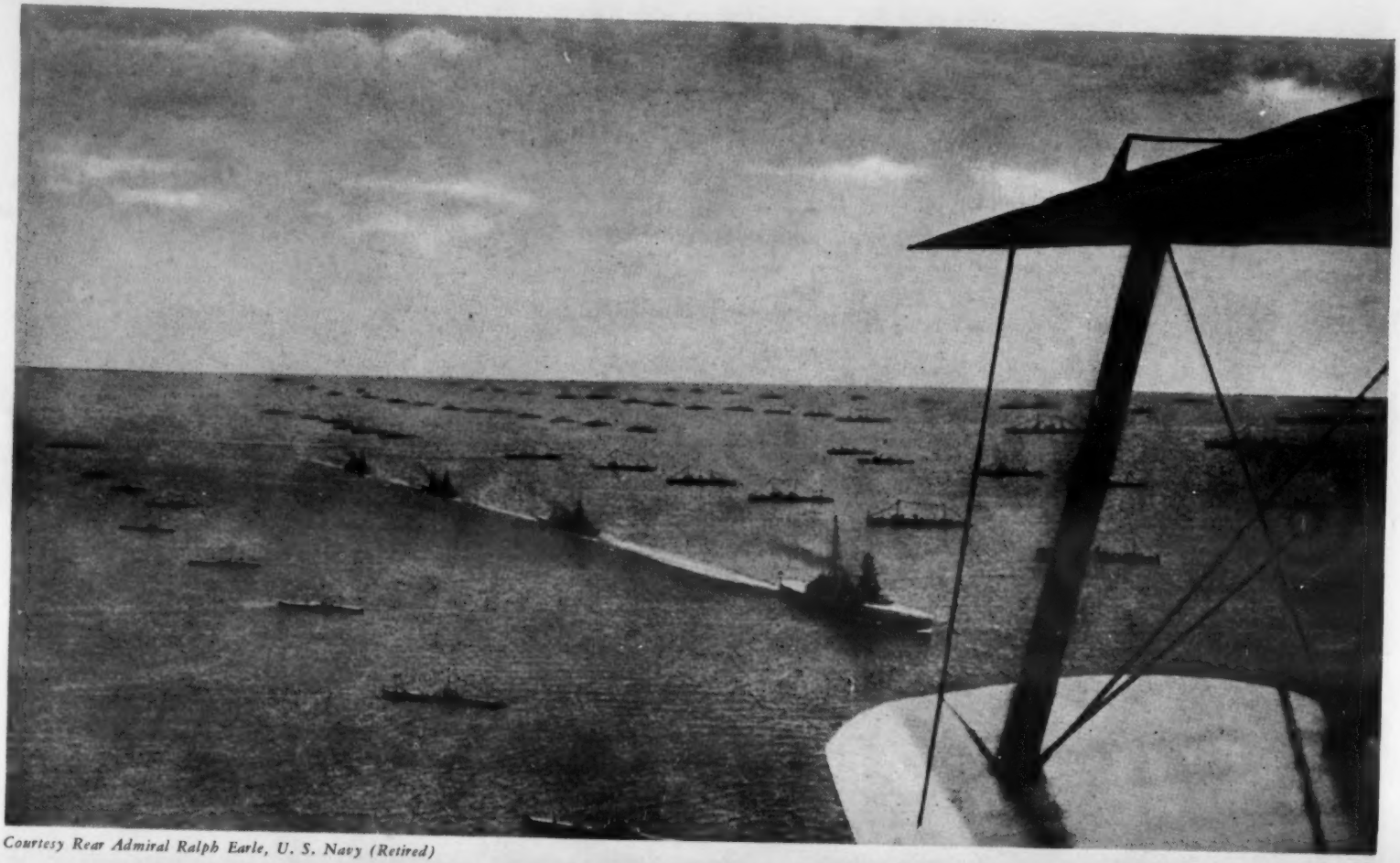
31. That the total numbers of specialists recom mended in this report and the numbers to b selected annually be considered as subject to re vision as the needs of the service may demand.





Courtesy Rear Admiral Ralph Earle, U. S. Navy (Retired)

MAP SHOWING ANCHORAGE OF JAPANESE FLEET AND PATH TAKEN BY REVIEWING SHIPS
The area occupied is about six miles long and four miles wide.



Courtesy Rear Admiral Ralph Earle, U. S. Navy (Retired)

AIRPLANE VIEW OF REVIEWING SHIPS WITH *HARUNA* LEADING,
SHOWING SUBMARINES AND DESTROYERS

AIRPLANE VIEW OF REVIEWING SHIPS WITH *HARUNA* LEADING,
SHOWING SUBMARINES AND DESTROYERS

Courtesy Rear Admiral Ralph Earle, U. S. Navy (Retired)

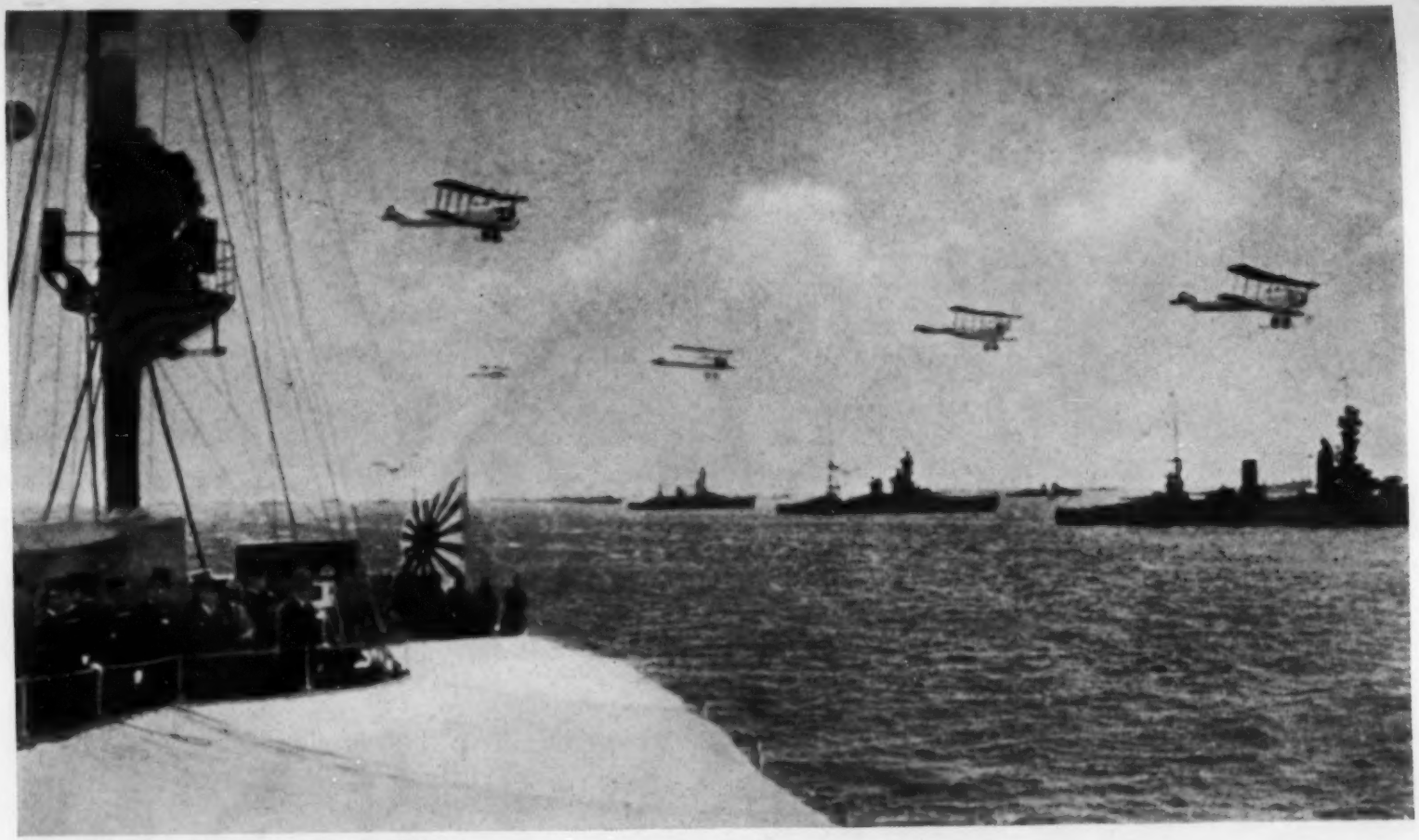
SEARCHLIGHT DISPLAY WITH BATTLESHIPS *MUTSU* AND *NAGATO* AT THE RIGHT

Courtesy Rear Admiral Ralph Earle, U. S. Navy (Retired)

ANTIAIRCRAFT GUNS WITH DESTROYERS IN BACKGROUND

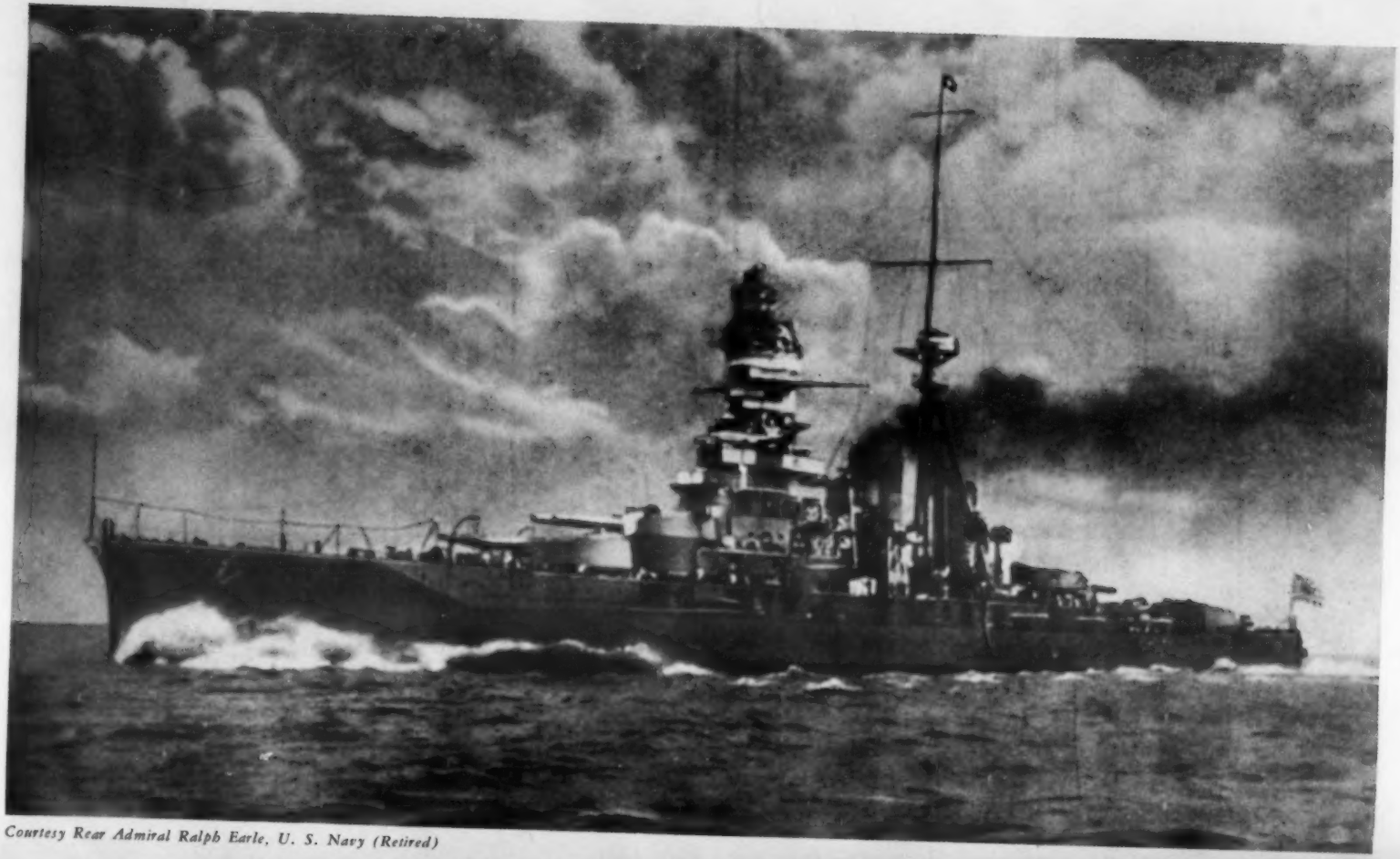
Courtesy Rear Admiral Ralph Earle, U. S. Navy (Retired)

ANTIAIRCRAFT GUNS WITH DESTROYERS IN BACKGROUND



Courtesy Rear Admiral Ralph Earle, U. S. Navy (Retired)

VIEW FROM ONE OF THE REVIEWING SHIPS SHOWING AIRPLANE SQUADRON AND BATTLESHIP *FUSO* IN RIGHT FOREGROUND

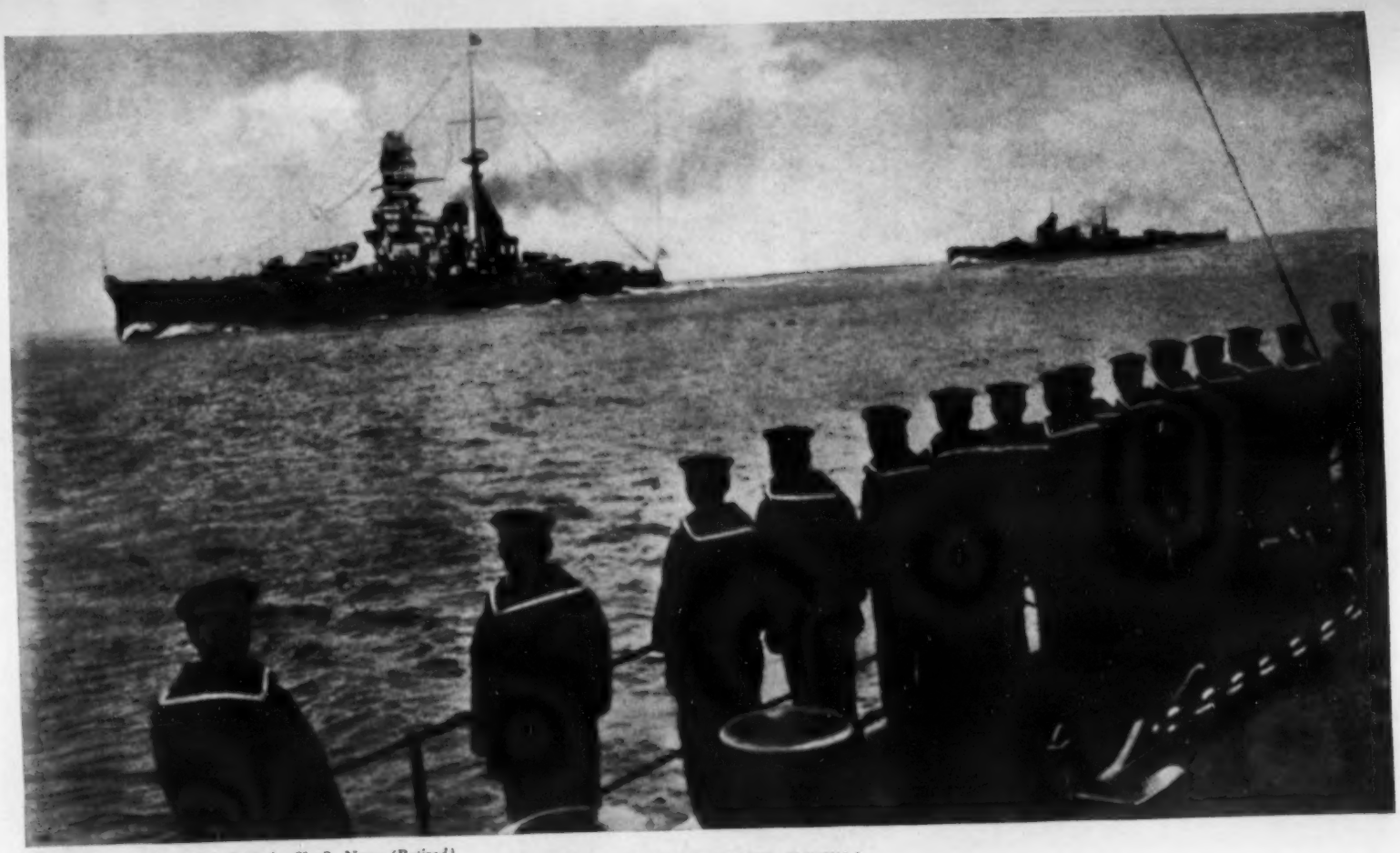


Courtesy Rear Admiral Ralph Earle, U. S. Navy (Retired)

THE BATTLE CRUISER *HARUNA* FLYING THE IMPERIAL STANDARD

Courtesy Rear Admiral Ralph Earle, U. S. Navy (Retired)

THE BATTLE CRUISER *HARUNA* FLYING THE IMPERIAL STANDARD



Courtesy Rear Admiral Ralph Earle, U. S. Navy (Retired)

ANOTHER VIEW OF THE *HARUNA*

Courtesy Rear Admiral Ralph Earle, U. S. Navy (Retired)

HOISTING THE IMPERIAL STANDARD ON THE REVIEWING SHIP H.I.J.M.S. *HARUNA*, BATTLE CRUISER

THE BRITISH OCCUPATION OF GUANTANAMO BAY

By Lieutenant Commander Forrest Sherman, U. S. Navy

FAMILIAR as most officers of the United States Navy are with the vicinity of Guantanamo, the fact that Guantanamo Bay was a British naval base in the year 1741 is little known. The commanding position of Guantanamo with relation to the strategy of the Caribbean, and to the Windward Passage in particular, is well appreciated. The fact that the British once occupied Guantanamo and attempted the seizure of Santiago for the purpose of safeguarding British trade furnishes an interesting exposition of certain problems of trade defense as applied to so well-known an area.

In the years 1739-1748 Great Britain's total annual revenue was in the neighborhood of ten million pounds. At the same time imports from the West Indies alone ran to one and one-third millions and by 1800 had increased to seven million pounds annually. The West Indies trade was, therefore, of vital importance to the British merchants and the heavy import duties formed a large proportion of the government's income. The greater part of this lucrative trade came from Jamaica and consisted for the most part of sugar and its by-products. Exports to the West Indies consisted of the many various articles needed in a rapidly growing colony.[1]

In times of peace the homeward-bound trade from Jamaica passed along two routes; one west of Cuba and into the Atlantic past Havana, and the other past Santiago and into the Atlantic through the Windward Passage. In times of hostilities with Spain, the western route was impracticable and the Windward Passage route was rendered difficult by the activities of Spanish cruisers, *guarda-costas,* and privateers.

Although Spain and England were at peace during the years prior to 1739, their commercial rivalry and conflicting ambitions with respect to colonial trade had led to many clashes. Spain denied to English subjects trading privileges with Spanish colonies except those allowed to the old South Sea Company by the Treaty of Utrecht (1713). British vessels commenced smuggling and trading in defiance of the Spanish navigation laws. Spanish coast guard vessels and privateers retaliated by seizing British vessels on the high seas, the innocent along with the guilty. In some cases British seamen were brutally maltreated by their captors. In 1739 Great Britain determined on reprisals, demanded indemnities for the Spanish depredations, and prepared for hostilities which soon followed.

Edward Vernon, Vice-Admiral of the Blue, commanding the West Indies Squadron, had taken Porto Bello on November 22, 1739, with a force of only six ships and had become the hero of the hour. In 1740 lack of reënforcements and supplies and the presence of a superior French squadron of doubtful neutrality at Martinique had caused Vernon's operations to be limited to maintaining cruising vessels on the stations necessary for trade protection and to the escorting of important convoys clear of the danger from Spanish cruisers. In March, 1741, after being heavily reënforced for the purpose of offensive operations, he undertook an attack on Cartagena with thirty heavy ships, numerous frigates, fire ships, bomb vessels, and transports, in all 124 sail carrying a landing force of fifteen thousand troops.

Vernon had written to the Duke of Newcastle in October, 1739,[2] "I can never be the adviser of land expeditions, especially into this country, that may drain the Royal treasury, and, in case of a French war, disable His Majesty from keeping a superiority at sea, on which, in my apprehensions, both the security and the prosperity of the Kingdom

[1] Bryan Edwards, *History of the West Indies.*

[2] H. W. Richmond, *The Navy in the War of 1739-48.*

depend." In January, 1740, he wrote further, "In my judgment, I should limit all expeditions to this country to be entered upon immediately on their arrival, and to be executed within the first six weeks, before their men would begin to fall sick." The soundness of these judgments was soon to be proved in spite of his wishes in the matter. The Cartagena expedition was a failure due to delays, differences of opinion between Vernon and General Wentworth who commanded the troops, and, on the military side, absolute lack of realization of the necessity for speed, dash, and intelligent acceptance of the risks incident thereto, in operations in a climate where continued exposure meant almost certain sickness to the European.

On May 26, 1741, Vernon, Wentworth, and Governor Trelawney of Jamaica, decided to attempt to capture Santiago in pursuance of the home government's policy of offensive warfare against the Spanish colonies. The selection of Santiago as an objective was governed by three reasons. First, it would be valuable as a base for further operations against Cuba. Such operations were under consideration and Governor Shirley of Massachusetts was already offering land grants to prospective settlers in Cuba. Second, Santiago was strategically located between the Spaniards in Cuba and the French in Haiti whose entry into the war was imminent. Third, and most important of all, it was urgently necessary to check the depredations of Spanish privateers operating from Santiago.

Vernon sailed from Port Royal on July 1 in his flagship *Boyne*, eighty guns, with eight ships of the line, one intermediate ship, eight frigates, and some forty transports, carrying 3,400 troops under Wentworth. Eight additional heavy ships, of which three were refitting, were left at Port Royal. Among the troops was the remnant of the American regiment, in which served Lawrence Washington who later named his estate Mount Vernon after his commander. On July 18 the fleet arrived at Guantanamo, which had recently been reconnoitered and found undefended, and which was at that time known to the English as "Walthenham Harbour." Hervey, in 1779, described Guantanamo as "a large and secure haven, which protects the vessels that ride in it from the hurricanes which are so frequent in the West Indies."

The *Ripon*, sixty guns, Captain Rentone, had been sent ahead, leaving Port Royal on June 25, to reconnoiter Santiago. After receiving Rentone's report, a council of war was held on July 20 which decided to attack Santiago from the shore side, marching the troops overland from Guantanamo, and delaying the attempt to force the entrance until the troops had attacked the city from the weakest side. Accordingly the disembarkation was commenced. The bay was at this time renamed Cumberland Harbour.

Vernon apparently foresaw very little difficulty in a rapid march to Santiago against the slight resistance to be expected from the Spaniards. Wentworth, on the other hand, was greatly impressed by the difficulties of the Cuban jungle and the unusual effort required for the construction of roads and clearing away of obstructions to the passage of guns and heavy equipment. He was not the type of commander to push forward without deliberate and careful reconnaissances, construction of defended camps, or without his heavy equipment. He halted his advance short of Santa Catalina de Guantanamo (Guantanamo City), saying that advance to that point was impracticable. After strong representations from the naval commander, he again advanced and reached Catalina without resistance. In its vicinity he went into camp and there remained. To a force of Europeans, such a slow protracted campaign was bound to be fraught with danger. The disadvantages of Wentworth's delays can be appreciated when we consider the difficulties experienced by the American Army in a much shorter advance under much more enlightened conditions of sanitation. Shafter's 5th Army Corps landed on June 22, and Santiago capitulated on July 14, 1898. On August 3, the troops having been ashore six weeks, the general officers commanding divisions and brigades present subscribed to the famous "Round Robin" stating in part:

> The army is disabled by malarial fever to such an extent that its efficiency is destroyed, and it is in a condition to be practically entirely destroyed by the epidemic of yellow fever sure to come in the near future. This army must be moved at once or it will perish.

The chief surgeon of the army corps and all the surgeons of divisions stated further:

> There is imminent danger that the yellow fever, now sporadic and of a mild type, may any day assume a virulent type and become epidemic.

Vernon openly criticized Wentworth's conduct. For over a month a most energetic correspondence ensued between the admiral and the general while operations ashore were limited to foraging and scouting parties from the camp on the river bank near the present Guantanamo City. Hervey[3] records the farthest advance as being that of a reconnoitering party under a Major Dunster which reached the village of Elleguava supposed to have been situated about sixteen miles from Santiago. This unit consisted of about 150 Americans and Negroes. Meanwhile the main body of the troops was succumbing rapidly to disease.

By the end of September all thought of offensive operations on shore had ceased. Over a hundred men died of sickness in one week and the effective strength of the army had dwindled to little or nothing. One member of the expedition wrote:

> Our men are very sickly and die fast, more from want of necessaries than the inclemencies of the climate I fear. Some die from their own excesses in drink.

As soon as the army was disembarked, light vessels had been sent to watch the Spanish fleet of twelve of the line under Don Rodrigo de Torres in Havana; the transports had been sent to the upper bay; a blockade of Santiago had been instituted; and the six heaviest British vessels were anchored in line across the entrance to Guantanamo to guard against surprise attack from the sea. On September 2, Vernon went round to Santiago to make a personal examination looking toward forcing the entrance with his ships, but decided it to be impossible because of the heavy batteries, narrow entrance closed by a boom, and the uncertain, shifting offshore winds. The correctness of his decision was supported by the experience of Sir Charles Knowles who commanded a naval attack on Santiago in 1748 and had to withdraw because of a boom in the entrance, fire ships, the unexpected strength of the batteries, and the shifting wind.

While the forces on shore remained inactive, the fleet, in spite of the threat of the Spanish squadron at Havana, operated extensively against the enemy privateers and cleared them from the Windward Passage. A number of valuable prizes were taken, including three regular Spanish men-of-war. While a nucleus of heavy ships remained at Guantanamo at all times, from which strong units could be detailed for convoy duty, cruising vessels were distributed on various stations. One unit was maintained on blockading station off Santiago, one to windward of Cape François on the north coast of Haiti to protect British trade coming from North America, and one off Cape Bacca to protect trade passing along the south shore of Haiti. Meanwhile other cruisers operated offensively against enemy trade to windward of La Hacha on the route from Spain to Cartagena and Porto Bello, on the north coast of Cuba on the route through the old Bahama channel, and off Cape Corrientes on the important enemy route from Cartagena and Porto Bello to Vera Cruz and Havana.

Richmond[4] says:

> The Spanish privateers, driven by Vernon's cruising ships from the favourable areas like the Windward Passage and the track south of Hispaniola, had extended their operations further north and were even meeting ships as far away as lat. 30, to the southward of Bermuda, entailing a far greater effort upon the British cruisers. Spread over a greater area the privateers were more difficult to deal with by cruising methods, and the only satisfactory method of securing the trade was by convoying it through the whole of the danger zone. The smaller ships, sloops and lesser craft, were scattered in the channels used by the trade, the more powerful ships were employed in convoys, and the bulk of the ships of the line was massed in a squadron to cover the operations of the army. The defeat of this squadron, Vernon remarked, would overthrow all other objects; for the ring would then be broken and the whole organization would fall to the ground, a very good example on a small scale of the complementary duties of ships of the line and cruisers.

During October, orders arrived requiring the return to home waters of a large portion of the fleet preparatory to operations in the Mediterranean. By the latter part of October over 2,000 troops were down with fever. Meanwhile the Spaniards had strengthened the defenses of Santiago to such an extent that all chance of successful attack had disappeared. On October 5, Wentworth had written to say that nothing further could be done and on November 7 a military council of war resolved that the surviving troops should be re-embarked. Accordingly on November 20, re-embarkation commenced and the four months' occupation came to an

[3] Hervey, *Naval History of Great Britain, 1779.*

[4] H. W. Richmond, *The Navy in the War of 1739-48.*

end. Vernon, in his rage at the outcome of the expedition, asked to return to England to avoid further operations with a general whom he termed "more changeable than the moon."

Hervey's account reads:

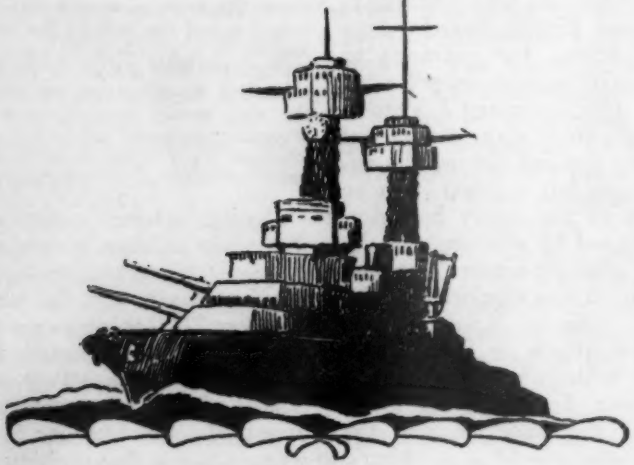
> Thus ended the operations in the West Indies during the year 1741, in which the lives of many brave men were sacrificed through the misconduct of their commanders.

General Shafter stated after the war that, while en route to Cuba in June, 1898, he read an account of Wentworth's failure and that it convinced him that his sole chance of success would lie in the very impetuosity of his attack.[5]

The operations sketched above are of unusual interest since they were undertaken as a direct measure of trade defense in an area where trade protection has been and may be again a matter of concern. Although the attack on Santiago was unsuccessful, and the occupation of Guantanamo Bay soon terminated, they serve, together with the attendant operations at sea, to emphasize the importance of the capture of enemy bases as a measure of trade defense. They also serve to demonstrate the usefulness of a centrally located operating base for the defense of a vital trade route. The capture, or destruction, of enemy bases of operation has always been a fundamental method of trade defense. Mahan speaks of "the enemies' colonies, the foreign bases of their sea power and, in the absence of great fleets, the only possible support upon which commerce destroying can depend; with whose fall it must also fall."[6] And again, when "the enemy confines himself to commerce destroying by crowds of small privateers, then the true military policy is to stamp out the nests where they swarm."

[5] Alger, *The Spanish American War.*

[6] Mahan, *Influence of Sea Power on the French Revolution and Empire.*



NOTES ON NAVAL RESERVE TRAINING CRUISES

By Lieutenant (J. G.) Hanson W. Baldwin, U. S. Naval Reserve

EIGHT thousand officers and men of the naval reserve, the Navy's second line of defense, were cruised on destroyers or other commissioned vessels of the Navy during the summer of 1930. In a series of fifteen-day cruises along the coasts of the United States the personnel who will comprise the nucleus of the country's "civilian navy" in the event of war were instructed in up-to-date methods aboard a man-of-war.

The enlisted men and petty officer ratings, some of whom had never been to sea before, probably benefited more from their experience than did the officers. Swabbing decks, shining brightwork, standing wheel and lookout watches, learning how to heave a lead and point a gun, they picked up the essentials of the minor but fundamental duties of their grades. That the reserve officers did not profit as much as the men they commanded was due, in some ships, to an overemphasis on supervision, and in others to an almost total lack of such supervision.

In considering the first of these causes it would seem that since the war perhaps a greater advance has been made in the organization and the administration of the naval reserve than in the training of our second line of defense. The lead line and the gyrocompass were in use then as now, but war-time necessity had brought about less detailed supervision, had rationed out more individual responsibility and had given both officers and men more initiative and self-confidence and more latitude of action. In getting back to a peace-time basis, it was well that commanding officers and others senior in rank should draw freely from their knowledge and experience to supervise the activities of those under their command in order to bring about a rigid and uniform standard. But in many ways and particularly in the training of reserve officers on the passage of the years this tendency has become too detailed to be beneficial. With the passage of the years this tendency has become stronger and stronger until at present reserve officers, and in many cases, regular junior officers are allowed so little latitude in ship handling, in watch standing, and in general duties that their training is seriously handicapped. The modern method seems designed to relieve the reserves and the embryo admirals, the Navy's junior officers, of as much responsibility as possible.

"Damn," one of the somewhat disgruntled reserve officers exclaimed, "in war time I used to have the deck while my ship was running through the submarine zone with lights out and zigzagging, and the old man wouldn't be sticking around the bridge the way the skippers do now. Now, one of the bridges of these destroyers during a reserve cruise is almost as crowded as Times Square and the reserve officer of the deck can scarcely give an order without detailed advice. I want to learn but I don't think that's the way."

The reserve's objection seems justified to one who has been on reserve cruises both as a "regular" and a reserve. In the majority of cases the reserve officer does not learn as much as he should during the fifteen-day cruise because he is not allowed sufficient responsibility, and accordingly he leaves his ship at the expiration of his tour of active duty without the feeling of self-confidence which he should have on the bridge or in the engine-room. In but few ships is he allowed to stand a top watch alone, even at the end of the cruise, and his chances for ship handling are few if any. Even in the daylight hours when chances of accident are less than at night, the reserve watch officer is supervised *ad infinitum*, until what self-confidence he has may be shaken or lost.

In some ships this fault of too much supervision does not exist but the reserves

are still denied responsibility. On one cruise which the author made as a regular, and on many others of which he has hearsay knowledge, the reserve officers were called on scarcely at all to fill the regular duties of their rank, and spent much of their time in lolling about in their bunks or playing cards in the wardroom. This condition is the fault of the commanding officer of the cruising ship. Unfortunately too many commanding officers and others associated with reserves consider the two weeks of cruising as a holiday designed especially for the reserves' benefit at the expense of the Navy. Both of these faults, over and under supervision and their consequent accompaniment withholding of responsibility, are tendencies in the wrong direction in the training of reserves. Perhaps it is a wise safety factor but scarcely a good training system.

Other criticisms of the reserve training system during the summer cruise as it is constituted today can be briefly detailed. The cruise itself, for maximum benefits, is too much "inshore" and not enough "deep sea." There are usually only one or two nights when the ship is under way after sunset and at no time, in the majority of cases, is the ship out of sight of land. Thus obvious handicaps, both as to practice in celo-navigation and to ship handling at night, are inherent in the training schedule.

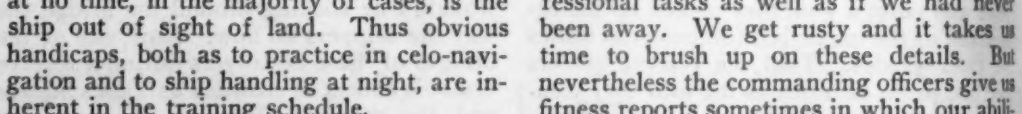
The target practice fired by the reserves is to a very high degree artificial. All practices, of course, suffer from the same fault, but the practices fired during each fifteen-day cruise are more obviously "practices" than any of the rest. It seems that for the sake of scores and competition as much as for the sake of value and knowledge gained in the practice, the old short range, slow speed firing is retained. The value of such a practice to the officers is extremely doubtful. It would seem a bit more realistic and would provide considerably more practice if the speed of target and towing ship could be increased, the range opened, and the course changed once during the firing. The present 1,000-yard point blank firing accustoms the reserves to a firing routine which is of dubious if any value in war time.

The final criticism of the training methods is rather applicable to the engineers than to the deck force. Since destroyers and all ships would be called upon frequently in war time to run at maximum or near maximum speed, it would seem wise to inaugurate a bit of high speed running in the training cruises to accustom the reserve engineers to the problems that such speeds bring. An hour or less at twenty-five to thirty knots would suffice if careful and intelligent instruction were given by the "regulars."

A complaint, rather than a criticism, which the author has heard voiced by some reserve officers is the final "kick" to be recorded here.

"Many skippers think we can come directly from our desks or factories to the bridge of a ship and remember all our professional tasks as well as if we had never been away. We get rusty and it takes us time to brush up on these details. But nevertheless the commanding officers give us fitness reports sometimes in which our abilities are compared with those of the regulars instead of comparing us with other reserve officers."

This complaint, based in at least one case on just such an invidious comparison, should be heeded, for there is no more embarrassing blow to the pride of a reserve officer than to feel that he is of little or mediocre value to the Navy. In all fairness his merits should be compared with those of other reserves rather than with officers of the line.



A DESTROYER ENGINEERING DEPARTMENT

By Lieutenant Guy Chadwick, U. S. Navy

THE young officer assigned to engineering duty on a destroyer is confronted with a maze of technical details. If he has received special training for this assignment, it is probable that the technical aspect of his duties has been stressed. Such circumstances are prone to engender a state of mind wherein complicated minutiae obscure the fundamental principles of successful organization and administration.

This paper purposes to present a system of basic principles which, if consistently pursued, should yield quick and satisfactory results. The simplicity of these principles is such that an adherent to them should never be in doubt of the direction in which his efforts will yield maximum results.

What Is to Be Done

The plant must be caused to operate reliably. The plant should operate efficiently. In general, efficiency is a corollary of reliability. However, it must be realized that readiness for duty and ability to operate under abnormal conditions often take precedence over competitive score. The conception of the term "efficiency" should include such synonyms as capability, potency, productiveness, and effectiveness.

Normally all other considerations should be subordinated to reliable and efficient operations.

How It Is to Be Done

First, consider the use of immediately available means. Have information. The engineer officer must be completely and continuously informed of: (1) personnel, individually and collectively; (2) work to be done and its progress; (3) operating conditions; (4) paper work.

How to Obtain Information in an Available Form

Personnel.—Keep the watch, quarter, and station bills according to present requirements. Also, keep an individual card for each man showing: (a) name, (b) service number, (c) years of service, (d) years to serve, (e) rating and date, (f) special training or experience, (g) mark in general ability, (h) general remarks as to his character, personal problems, status with regard to courts-martial, ability to hold higher rating, etc.

Work.—Find out what work is to be done by (a) reference to logs, inspection reports, etc.; (b) personal inspection; (c) daily reports from leading petty officers; (d) indoctrination of all personnel to observe and report. List all work. Do not neglect items because they are of minor importance or because they will last a while longer without repair. Note that the flow of all work, both by ship's force and by other repair forces, depends primarily on the excellence of the work list.

Inspect daily for work progress.

Keep check-off list of who is on what job.

Operation.—Determine best methods of operation by (a) study of pertinent information in available bulletins and pamphlets; (b) study of own logs and records; (c) consultation with engineer officers of other destroyers and with staff engineers.

Ascertain that best methods are continuously in effect by (a) personal inspection; (b) frequent routine reports by leading petty officers; (c) study of logs and records as they come to hand.

Paper Work.—Keep paper work continuous and up to date by (a) check-off list; (b) rigid requirements of petty officers in log-writing and data-keeping; (c) careful supervision by storekeeper of all supplies, spare parts, etc. His ledger should show amount allowed, amount on hand, condition of what is on hand, expected consumption, normal time to replace, and usual place of issue. This data should be kept up to date by frequent inventory and the use of a chit system.

How to Use Information

Personnel.—Each major subdivision of the engineering department must be definitely placed under a single supervisor. The firerooms must be placed in charge of a capable man whose duties are fundamentally executive and supervisory. It is of utmost importance to note that the scope of his primary duties is so great that it cannot be allowed to suffer by reason of active participation in repair work. It is not desirable for this man to stand watch, but he should be available at all times. The enginerooms should be placed in charge of a capable man whose duties are similar to those of the man in charge of the firerooms. The auxiliary station must be put in charge of a capable man whose duties are primarily executive and supervisory. The personnel attached to this station is relatively small. Therefore, the man in charge must take an active part in repair work so that the percentage of available man-hours be not disproportionately sacrificed. The electrical station must be in charge of a capable man whose duties are similar to those of the man in charge of the auxiliary station.

In addition to the above stations, competent men must perform the following duties: oil king, storekeeper, lathe hand, and main-generator repair man.

Work.—The sequence of the day's work normally should be: (1) brightwork, etc.; (2) upkeep; (3) cleaning up. None of these three subdivisions may be neglected without harmful effect on the other two.

The engineer officer personally must assign all work. This should be done daily for the following day, after consultation with the leading petty officers. The work designated should be posted in such a form that each individual of the engineering department will read after his name his task for the day.

To properly assign work, estimates of man-hours must be made. Since not more than six type jobs exist in a destroyer engineering department, a little practice renders easy the accurate estimate of man-hours.

Estimates should be made from the point of view that man-hours are to be suited to the work on hand rather than that the work on hand is to be apportioned according to available man-hours.

Continuous supervision of work must be exercised by leading petty officers.

The engineer officer must inspect each important job frequently and all jobs after completion.

The general priority of work should be: (1) little jobs by ship, and emergency jobs; (2) big jobs by ship; (3) tender jobs; (4) navy yard jobs. In this manner small jobs will not be allowed to pile up until they overwhelm the work load and complicate the work list.

Operation.—Regular periods should be set aside for the instruction of personnel. Instructions regarding the use of each piece of machinery should be posted adjacent thereto. These instructions should include not only the ordinary operations of starting, stopping, and handling casualties, but also pertinent data relative to speeds, pressures, combinations, etc., to meet varying conditions of power and operation.

Paper work.—A careful inspection of data found in logs and reports will frequently result in the detection of faults in operation and upkeep and will form the basis of many ideas of improvement.

Consider means of building for the future. Train personnel (a) by requiring petty officers to do so; (b) by regularly organized school and instruction. Training should be based on repairs and on operation, including knowledge of what is being worked for in the way of performance.

Give personnel reasonable hope of advancement in rating.

Do not neglect training beyond the requirements of your own ship.

Indoctrinate deck officers in methods by which they can assist in establishing good engineering practice and performance.

Keep the commanding officer fully informed at all times. Show him that you are working with him and abhor the defensive attitude.

The health and comfort of the engineer force should be a matter of concern. Living quarters and clothes must be kept clean. Rations must be satisfactory.

It is important that the engineer officer balance his mental attitude so that he will always be working on fundamentals. A few simple tenets followed consistently will help to establish such a balance.

Do not perform work that a subordinate can be caused to do with equal efficiency.

Subject the advice of subordinates to strict analysis.

Cultivate the inspection habit.

The product of available man-hours times the work to be accomplished cannot yield a constant competition percentage over a period of years.

There is no mysterious thing which, when found, will solve the problem of efficient and economical operation.

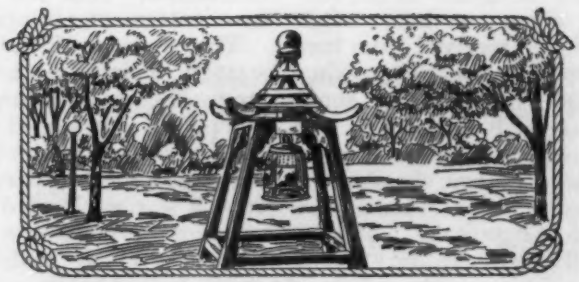
It is particularly difficult to start constructive action which will require continuous effort.

A few minutes' consideration will render apparent the most important motif of the day's work.

Action should not be taken nor permission given without consideration of the result.

Cleanliness promotes health in valve stems, pump rods, bushings, bearings, and glands, as well as in personnel.

The system of administration outlined above requires of the engineer officer from three to five working hours a day.



RADIO DIRECTION FINDER—THE NAVIGATOR'S FRIEND

By Lieutenant W. S. G. Davis, U. S. Navy

WITH the installation of the new radio direction finder on more and more Navy ships, an ever increasing number of navigators are slowly but surely welcoming and hailing a new shipmate and friend. For the information of those not blessed with this aid and to encourage its extensive use by those who are, this eulogistic account of the successful use of the *Patoka's* instrument is gladly set forth.

Two days before her scheduled departure from the navy yard the *Patoka* went out for a postrepair trial and to test and calibrate a radio direction finder. It was formally introduced to the new navigator on the second day following, about two hours after his arrival on board, and received from him many glances of respect, doubt, and growing hope as the weather turned from snow through rain into fog, while a leaden sky indicated an early and intimate acquaintance. On that maiden voyage, the new instrument made firm friends for no sights were possible and Chesapeake lightship eventually oozed through the mist right where the bearings said it would.

From that trip on, this new aid to navigation has seen continuously growing and ever useful service. Confidence has grown with each group of bearings taken and found by simultaneous or later terrestial or celestial fixes to have been remarkably accurate.

This is not intended as a technical paper and no attempt to describe the make-up or "internal workings" of the instrument will be made here. Suffice it to say that it is a highly refined radiocompass with the deviation error corrected by a cam compensator which enables the navigator to read from the attached gyrocompass repeater the true bearing of any radio transmitter within the frequency range of the receiver. The application of a small correction converts this so that it may be laid down on a chart just as though the bearing had been taken with a pelorus.

To those who have been through the radiocompass problem of tracking a target by this means, the idea of tuning in on Diamond Shoals, Chesapeake, Winter Quarter, and Five Fathom Bank lightships for a fix when some one hundred miles from the nearest must have its appeal. Lines are set down and run forward to cross meridian altitudes, sun lines, or other direction finder lines, soundings are taken and plotted on these lines and all sorts of queer combinations are in every day use in the *Patoka's* charthouse. And the possibilities of this new instrument are almost limitless.

The absence of radio beacons at some strategic points, the now decreasing silent stretches between operating periods and the low power of some led to the simple experiment of utilizing radio broadcasting stations for beacons. Experience has shown that such a station, located near enough to the coastline to eliminate errors due to the waves traversing land, makes an ideal beacon. Indeed it is quite common for the *Patoka's* position approaching the Florida straits from the Gulf of Mexico to be indicated by the intersection of lines from Clearwater, Florida, and Havana, Cuba,—the work of the radio direction finder.

Of course it has its limitations. Until some kind friend of humanity invents an effective static eliminator, no radio receiver will produce enjoyable sounds in an electrical storm, and it is in stormy weather, when sights are impossible, that the importance of this installation is perhaps the greatest. Yet how much easier it is, instead of making an estimate, which must at best be a guess, as to what time to turn northeast to hold the Gulf Stream, for the navigator to say "With Jacksonville bearing west by radio direction

finder, course should be changed." Surely the great advantages of the new friend greatly outweigh its limitations.

I am going to yield here to the temptation of sketching a Jules Vernian possibility for the future. Aircraft today make use of radio beacons in locating landing fields and keeping them "on their course" during periods of poor visibility. An instrument on the dash records the amount and direction in which they creep off. Why not then, on the SS. "Tomorrow" a day out of Liverpool for New York, a needle in front of the helmsman which shows him "steady on" the radio beacon at Nantucket Shoals lightship—2,500 miles away? And why not go a step further and hook up two of the present-day navigational wonders? Why not a "metal mike" operated by a radio direction finder? With high-powered radio beacons at important points, the desired beacon would be tuned in, course set to agree with the bearing obtained and the "metal mike" cut in to hold her "steady so." The visualized picture of a stream of ships riding down these main highways of the ocean may recall to many the pert comments of a beloved instructor in the chartroom of the navigation department at Annapolis:

"Gentlemen," he was wont to say, "I wish you would remember that there are no whitewashed tracks on the ocean and no signposts to tell you when to change course!"

Perhaps the radio beacon and the radio direction finder may yet eliminate this sad deficiency.

SPECIAL BOATS FOR LANDING OPERATIONS

By Major Harold H. Utley, U. S. Marine Corps

MANIFESTLY this subject is one of the greatest importance to every officer in the naval service who may be connected in any capacity with forced landings. At the present time there appears to be no adequate supply of suitable boats, nor any generally accepted doctrine based on experience or experiment as to just what characteristics such boats should possess. It is in the hope of awakening interest in and promoting discussion of this subject so that all apparently reasonable ideas may be developed, tried out, and ultimately the best types adopted as standard, that this article has been prepared. It is perhaps too much to hope that a supply sufficient to meet the requirements of a major emergency will be procured in advance, but at least the most acceptable types can be determined, plans approved, provision for the rapid production of sufficient quantity to meet the initial requirements of a major emergency be made, and a few for training purposes provided.

As to the necessity for something more than the regular allowance of boats furnished ships in the fleet, it may be stated that the Marine Corps school recently made a computation of the boats of existing types that would be required in executing a forced landing by one Marine Corps division and two battalions of 155mm guns. It was found that all the boats the Navy has in store at east coast navy yards plus all that the Coast Guard has in store on the east coast plus everything except lifeboats on ships of the Scouting Fleet plus the three experimental boats now at Quantico,—371 boats of 13 different types,—would be barely sufficient to land the foot troops (less than a battalion of light artillery, and the aviation component, although the rear echelons of all units would be left on the transports). It was found that it would be necessary to utilize three YFs and three 500-ton coal barges from the naval district to provide for the medium artillery, the remainder of the light artillery, and the tanks. Some of these types, due to lack of speed or other causes, are not very well suited to this duty and the fitting of the various task organizations into boat groups that would be at least somewhat homogeneous, requires careful manipulation. It is a much more difficult problem than that involved in putting the same sized liberty party ashore, or even of landing an equal naval brigade to participate in a parade ashore. It is a foregone conclusion that in any major emergency the fleet will need bases beyond those now in existence, and that the Marine Corps as the military arm of the fleet should be prepared to occupy or capture those necessary bases. The movement from ship to shore involves the use of boats, many boats. The Navy operates and supplies them, and it seems only in keeping with our naval doctrine that we should endeavor to provide suitable boats so far as our resources permit, and eliminate from peace-time use as many types unsuitable to our war needs as we can.

As has been stated, there appears to be no generally accepted doctrine as to the characteristics of the boats desired. There are those who favor the large armored boat commonly known as the "beetle boat" such as was used by the British at Suvla Bay in the Gallipoli campaign and the Spanish at Alhucemas in Morocco in 1925. This boat is armored against rifle, machine gun, and shrapnel fire, carries about 500 men (one battalion, less one rifle company and all rear echelons, Marine Corps war strength), has a speed of about five knots and probably draws considerable water. Its advocates claim that it furnishes protection for personnel and equipment during the difficult phase of the operation, the movement from ship to shore, that it simplifies the exercise of command since the battalion commander has three-fourths of his command in the same boat with him, that since comparatively few boats will be needed it reduces the number of trained boat crews the Navy must

furnish, and finally that the fewer boats reduce the chances of confusion and of boats going astray during the movement. They also point to General Sir Ian Hamilton's praise of this type and to its successful use in actual campaign at Suvla Bay and Alhucemas. Its opponents object to it on the grounds that due to its size and slow speed it offers a most vulnerable target to high explosive shell and antiboat guns, that if one boat were disabled the front of a whole battalion would not be covered, and that the most critical period of the attack is not during the advance to the beach, but the moment of landing when the men disembarking are necessarily concentrated in a small area immediately surrounding the boat and will offer an ideal target for machine gun and automatic weapon fire. They consider unsound the movement of half a battalion or more in a mass to the hostile outpost line or possibly the main line of resistance before deploying. The difficulties of transporting these large unwieldly boats to a distant theater of operations unless there were an advance base conveniently located nearby is also noted, and finally they point out that neither the landing at Suvla Bay nor that at Alhucemas was seriously opposed at the water's edge, and that General Hamilton was comparing the "beetle boats" to the previous method of landing in tows of pulling boats when he praised them.

At the other end of the scale is the "paddle your own canoe" theory. There would be only two men to a boat; one would be both engineer and coxswain, while the other would be prone, employing, if opportunity offered, "marching fire" of his weapon (or of an extra automatic weapon provided with the boat.) The boat would be small, light, seaworthy, and comparatively fast, powered with a commercial type outboard motor. On reaching the beach all hands (both of them) would disembark, leaving the boat to be salvaged later by the beach party. The advocates of this type of boat would avoid losses during the movement from ship to shore by deploying in depth and frontage, assimilating as nearly as possible the lines of skirmishers in an attack on shore. They maintain too that no suitable target is offered the defender's artillery, thereby, in a measure, neutralizing the advantage the defender has in this arm during this stage of the attack. The opponents of this type argue that it is impracticable because of the large number of boats that must be supplied, the number of men that must be trained to handle them, the difficulties in control, the probable mixing of units, and the navigational difficulties of directing such a swarm of boats to their appointed places on the beach.

These two views represent the two extremes so far as boats are concerned. Probably each would be ideal under certain specific circumstances. For example, where the approach to the beach is through a comparatively narrow channel and the beach itself is protected from fire from farther inland by fairly steep bluffs the "beetle boat" would appear desirable, while on an open beach of considerable extent especially for a feint or a secondary attack where the attacker wishes to conceal his relatively small strength, the larger number of small boats well dispersed would tend to deceive the defenders. But the practical disadvantages of either type seem to outweigh the advantages, especially as neither seems to be suitable for general service in time of peace. But somewhere between these two extremes the solution must lie.

Recognizing the drawbacks to the "beetle" the advocates of the large boat have designed a 50-foot motor lighter commonly called the "A" boat. One of these has been constructed and is now undergoing tests. The armor is to be capable of resisting armor piercing small arms and machine gun fire. A canopy (also armored) extends as far aft as the engine compartment. It has been suggested that this canopy be removable to permit the use of the boat as a cargo carrier during peace time. The boat itself is quite seaworthy with twin screws capable of producing, when the boat is fully loaded, a speed of about eight knots. Empty it weighs 39,000 pounds. Fully loaded it draws less than 2.5 feet forward. It will carry quite a number of different, very handy "infantry teams" or task organizations composed of Marine Corps war strength units (with their rear echelons left on the transports) as follows:

1 rifle company (less 1 platoon) plus 1 machine gun section.

1 rifle company (less 1 platoon) plus one-half howitzer platoon.

1 rifle company (less 2 platoons), plus 1 machine gun platoon.

1 rifle platoon plus 1 section 3-inch Navy pack gun battery; (1 gun and 23 enlisted) with the gun in firing position.

Its advocates claim for it that it has all of the desirable features of the "beetle" without the latter's drawbacks. Its opponents maintain that it is excellent for the battalion supports, and possibly for the support platoons of the assault companies, and for all succeeding waves, but that for the assault echelons it is still "putting too many eggs in one basket," that it offers an excellent target to artillery and antiboat guns, that the front to be covered by two platoons in attack is too great for them to deploy after reaching the hostile outpost line (the beach) and finally that its size and weight preclude its general use in time of peace, besides rendering it extremely doubtful if a sufficient number could be carried on board and put overside from the available auxiliary transports.

Possibly to meet some of these objections there has also been designed and tested a 40-foot motor lighter commonly known as the "B" boat. It is an open metal boat with water-tight compartments, armored on the sides, single screw with the screw housed in a tunnel. Its speed is considerably less than the "A" boat and because of the tunnel, it lacks backing power to get itself off the beach. Its capacity is about two-thirds of the "A" boat, and its most useful load seems to be:

1 rifle company (less 2 platoons) plus *either* 1 machine gun squad or ½ howitzer platoon.

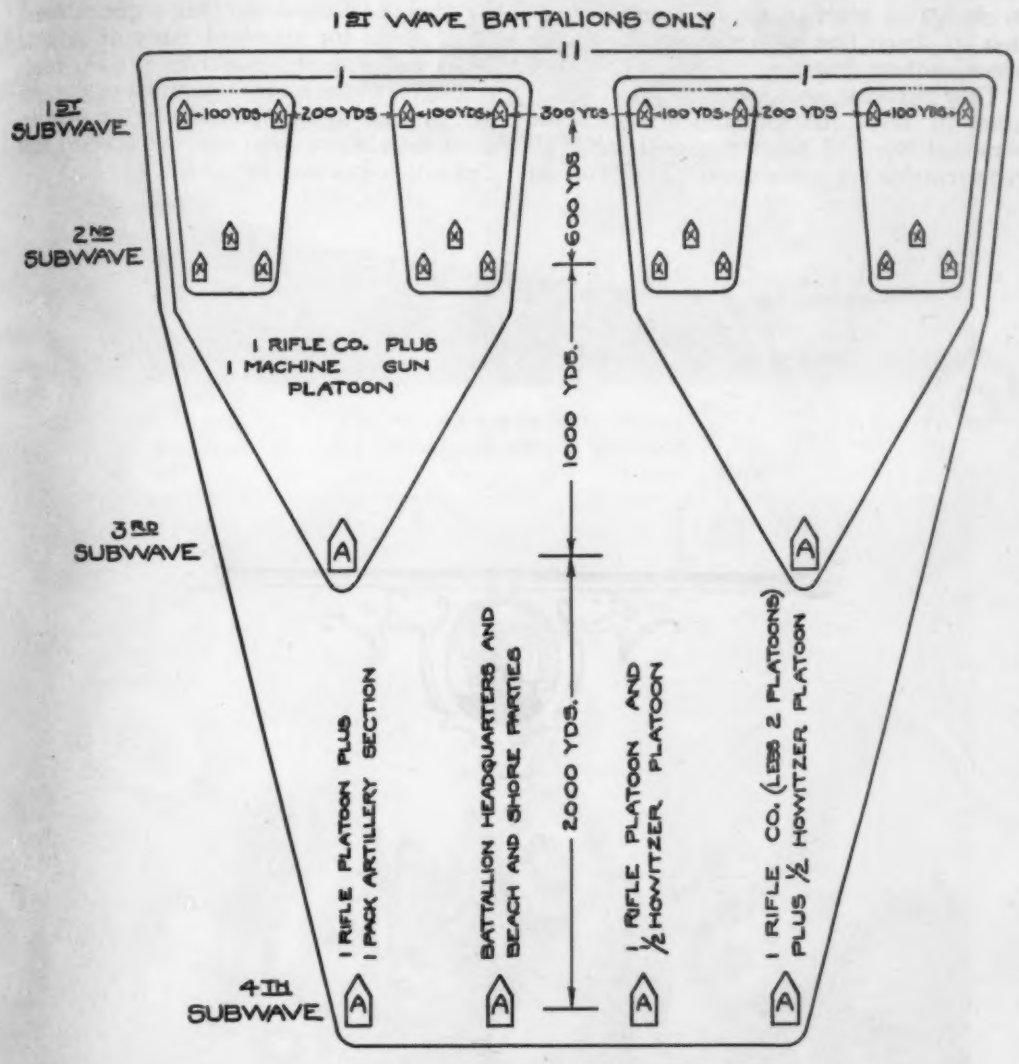
As a whole this boat appears to be neither one thing nor the other, and, as a matter of fact, has most of the disadvantages of both without any of the advantages claimed for either.

The advocates of the smaller boat visualize a self-propelled, shallow-draft, seaworthy boat with a speed of about twelve knots capable of carrying ten men fully equipped lying prone on the bottom, a crew of three men, one coxswain, one engineer, and one gunner, and with armor and a removable shield forward high enough to protect the coxswain and gunner and extending from the turn of the bilge to about one foot above the water line on the sides. They suggest that three types of boats now in existence: the standard Navy motor whaleboat, a Coast Guard power boat, and a commercial type known as a "seabright" skiff seem to possess many of the qualities desired and should be tested with a view of possible adoption or modification of one of them before proceeding to design a new type. This type of boat, frequently referred to as the "X" boat, it is claimed will have many uses aboard ship in peace time, will not be too expensive, and will permit flexibility of formation and deployment so as to reduce the target to be offered, without sacrificing control.

One other controversial point in connection with both types of boats should be noted. This is the question of armament. One group is adverse to any armament, principally it seems because they believe that the motion of the boat, especially if there is any sea on, will preclude any accuracy of fire, and to a certain extent because of the added weight involved; gun, gun shield, and gun crew. The other group maintains that, from the moment the ships supporting gunfire is forced to lift, to the time the artillery can go into action ashore, the greater the volume of fire, even if it is comparatively inaccurate, that can be directed at the enemy from the boats the better for the attacker. For this reason they advocate emplacing a pack gun or pack howitzer in one of the "A" boats carrying the battalion support, so that it can fire during the approach to the beach, and can continue to fire using the beached boat as a gun emplacement until the situation permits the crew to dismount the gun and manhandle it to a more advanced position ashore. And they urge provision for mounting one-pounders, or machine guns in multiple mounts, on all boats. These mounts must permit rapid train and elevation as well as high angle (antiaircraft) and horizontal fire. The machine gun (multiple) mounts must carry two 50-caliber machine guns. On the "X" boats it is proposed that the gun mounts be forward, and on the "A" boats, that a mount be installed on each quarter at the break of the canopy. While admitting that the roll and pitch of the boats will interfere with the accuracy of the fire, they do not admit that the resulting inaccuracy will be as great as claimed by their opponents, and maintain that the moral effect both on the enemy and on our own troops will be considerable, and furthermore they claim that all of these shots cannot miss everything.

And thus the matter stands at present except for the fact that there appears to be no argument concerning a suitable type in which to land the artillery and tanks, and for which at present there is no provision. Along with the "A" and "B" boats there has been designed a 45-foot artillery lighter which, strange as it may seem, appears to satisfy everybody who has observed it. It is a shallow-draft, *not* self-propelled, square stern barge with the gunwale across the stern cut away to permit the vehicles to be run off easily. Two short ramps pivoted so as to swing outboard easily and allow their outer ends to rest on the bottom furnish runways from the deck level to the ground.

One group of officers desires the "A" boat or something similar for the support and


1ST WAVE BATTALIONS ONLY
1ST SUBWAVE
2ND SUBWAVE
3RD SUBWAVE
4TH SUBWAVE
100 YDS
200 YDS
300 YDS
600 YDS
1000 YDS.
2000 YDS.
1 RIFLE CO. PLUS 1 MACHINE GUN PLATOON
1 RIFLE PLATOON PLUS 1 PACK ARTILLERY SECTION
BATTALION HEADQUARTERS AND BEACH AND SHORE PARTIES
1 RIFLE PLATOON AND ½ HOWITZER PLATOON
1 RIFLE CO. (LESS 2 PLATOONS) PLUS ½ HOWITZER PLATOON
= BOAT, X TYPE.
= BOAT, A TYPE.
NOTE: NOT DRAWN TO SCALE.
THE INTERVALS AND DISTANCES SHOWN WILL BE VARIED BY UNIT COMMANDERS ACCORDING TO THE REQUIREMENTS OF THEIR PARTICULAR TASKS.

succeeding waves and something along the lines of the proposed "X" boat for the assault waves with the artillery lighter for tanks and all artillery units (except accompanying guns transported in the "A" boats with the infantry). While recognizing that different situations will require different solutions, especially in the matter of distances, they visualize, as a basis for training both Marine Corps units and naval officers in charge of boat groups an attack formation for front line battalions similar to the accompanying diagram.

They advocate most earnestly the continuation of tests and experiments until the standard types of boats that will fulfill all requirements are a minimum. They further recommend the construction of a sufficient number to assign to each transport in commission as many of each type as could be utilized as replacements for boats now carried, and to assign to Quantico and San Diego for training purposes enough to transport a front-line battalion and a tractor-drawn battery.

While the writer is one of this group, he has endeavored here to present the views of all groups. Doubtless other arguments and other ideas for standard types of suitable boats will suggest themselves to many readers. It is in the hope of stimulating thought and interest in this matter in order that the most satisfacory type may be selected that this article has been prepared.

THE "A" BOAT BEACHED EMPTY
The forward port cover is unshipped.

Courtesy Major Harold H. Utley, U. S. Marine Corps

THE ARTILLERY LIGHTER BEACHED EMPTY
One ramp is secured, the other in position for disembarking load.

Courtesy Commander C. H. J. Keppler, U. S. Navy

ROAD THROUGH THE PALM TREES LEADING FROM ECLIPSE SITE, NIUAFOOU

One ramp is secured, the other in position for disembarking load.

525

Courtesy Commander C. H. J. Keppler, U. S. Navy

VENTS AND CREVICES IN LAVA FLOW OF JULY 25, 1929, NIUAFOOU ISLAND, TONGA

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ROAD THROUGH THE PALM TREES LEADING FROM ECLIPSE SITE, NIUAFOOU

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Courtesy Commander C. H. J. Keppler, U. S. Navy

READY FOR THE DANCE DEDICATING THE RADIO STATION ON NIUAFOOU

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READY FOR THE DANCE DEDICATING THE RADIO STATION ON NIUAFOOU

Courtesy Commander C. H. J. Keppler, U. S. Navy

NATIVES FROM NIUAFOOU ABOUT TO SWIM OUT TO STEAMER WITH MAIL

Courtesy Commander C. H. J. Keppler, U. S. Navy

DANCES BY SABAATA VILLAGE, NIUAFOOU ISLAND, SEPTEMBER 28, 1930

Courtesy Commander C. H. J. Keppler, U. S. Navy

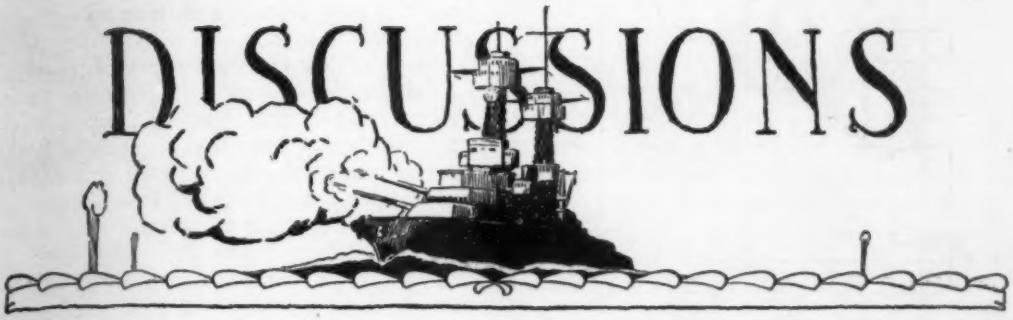
PALM-TREE MOLDS IN THE LAVA FIELD

These fields were left by the eruption which destroyed Futu village, July 25, 1929.

Courtesy Commander C. H. J. Keppler, U. S. Navy

A CALM DAY AT THE LANDING OFF ANGAHA VILLAGE, NIUAFOOU ISLAND, TONGA

DISCUSSIONS



A CALM DAY AT THE LANDING OFF ANGAHA VILLAGE, NIUAFOOU ISLAND, TONGA
Courtesy Commander C. H. J. Keppler, U. S. Navy

Pattern Sizes in Formation Bombing

(See page 1126, December, 1930, PROCEEDINGS)

LIEUTENANT WILLIAM S. PARSONS, U. S. Navy.—Formation bombing is being given much attention today in gunnery circles and its importance warrants careful study. Let us examine again the figure on page 1127 of the December PROCEEDINGS and see how the three families of curves agree, not only with each other, but with what one would expect to be a reasonable prediction.

The left-hand edge of the figure is an excellent place to begin because at this edge the pattern, for a finite target, is zero. Here, then, the three families of curves should meet because the pattern, whether of uniform or tapered density, is zero, and with a zero pattern it is either all or none in the matter of hits.

The fact that the families of curves from 40 per cent to 80 per cent, inclusive, fail to coincide at the left-hand edge makes it necessary to check all the curves in order to determine which are right and which are wrong.

It turns out that the dotted curves are correct within 1 or 2 per cent and that the others in some cases, are as much as 10 per cent in error. A computation made for several points (vertically) in the diagram for the full and the dashed curves at the middle and right-hand edge of the figure shows that the errors at the left-hand edge continue into the figure but are less in amount than at the edge itself. The full curves are correct where they intercept the horizontal axis. Now as to the dotted curves, what do they mean? The author says:

> And the curves drawn in dots show the probabilities of at least *some* parts of the patterns (of whichever type) falling on the target.

In a note he says:

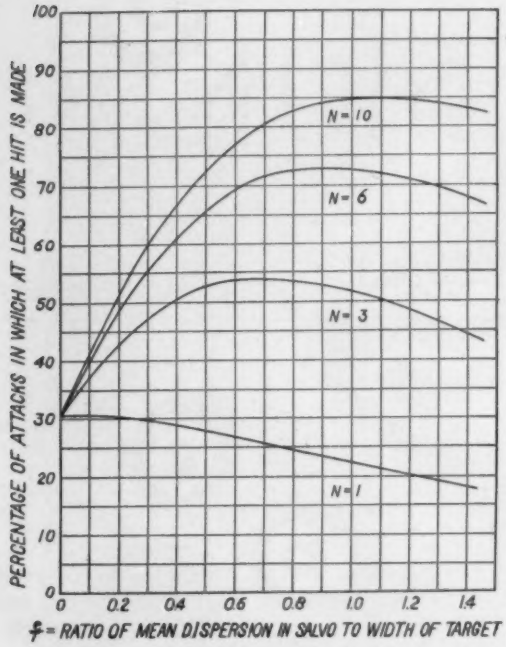
> In strict theory a uniform pattern of a finite number of bombs must overlap the target a finite amount to make a hit; and a tapered density pattern must overlap it still more. But investigation shows the omission of these effects exercises only a negligible influence on what follows.

From these quotations the dotted curves are defined to mean that the pattern, not necessarily one of the bombs in it, hits the target in the indicated percentages of approaches.

This would all be fine if the number of bombs were infinite. Substitute, for instance, sand for bombs and let our planes drop the sand at the target. Then these curves would give us a fairly accurate picture of the percentage of times that sand would come aboard, because the number of "bombs" would be close enough to infinity for all practical purposes.

However, the practical number of bombs that can be dropped is considerably removed from infinity and further calculations show that with (say) six bombs in the pattern, it *does* matter considerably whether the pattern is of uniform or of tapered density. In this case, the results for $P = 2T$, $S = T$: for uniform density—"some hits" (at least one hit), 90.4 per cent; for tapered density —"some hits" (at least one hit), 82.4 per cent. The curves in the figure referred to give about 77 per cent for both cases.

These differences in results cast doubt on the comparison shown on page 1127 relating to the 30 per cent hit cases, particularly since it is positively stated that the patterns under consideration will make "some hits" in the various percentages of attacks. Here the author departs from his previous definition and his statement does not apply to the curves drawn unless the number of



Curves drawn for the case in which the mean salvo error is equal to the width of the target. The curve for N=1 is also the *percentage of hits* for any value of N and is computed in that manner. The curves for N=3, 6, and 10 are computed by summation of individual probabilities in each case.

bombs is infinite, when an overlap *will* constitute "some hits."

As a further demonstration of the effect of the number of bombs in the pattern, a set of curves is drawn showing the percentage of times that at least one hit is made in the case of a normal pattern to which a tapered density pattern approaches in similarity. A normal distribution of salvo errors is also assumed.

From these curves it is evident that, although the percentage of hits decreases as the mean dispersion in salvo increases (pattern increases in length), the percentage of times that at least one hit is made reaches a different maximum for each value of the number of bombs considered in multiple bomb patterns.[1]

It is submitted, therefore, that the results obtained from the set of curves above takes into account a determining factor not considered by the author in his paper.

[1] The modern shotgun load is an example of a trial and error solution to a problem similar to this one, but much more complicated. To get the maximum weight of lead (percentage of hits) in the ducks in a series of shots, solid lead slugs (zero patterns) should be used, but to reach the "maximum duck" point it is necessary to spread the patterns slightly.

PROFESSIONAL NOTES

FEBRUARY 2 TO MARCH 1, 1931

COMMANDER D. B. BEARY, U. S. NAVY
LIEUTENANT COMMANDER D. C. RAMSEY, U. S. NAVY
AND
PROFESSOR HENRY BLUESTONE, U. S. NAVAL ACADEMY

UNITED STATES
Vessels Under Construction 536
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UNITED STATES

Vessels Under Construction, United States Navy—Progress as of January 31, 1931

Type number and name	*Contractor*	Per cent of Completion				*Probable date of completion*
		Feb. 1, 1931		Jan. 1, 1931		
		Total	On ship	Total	On ship	
LIGHT CRUISERS						
Louisville (CL28)	Puget Sound Navy Yard					Comm. 1/15/31
Chicago (CL29)	Mare Island Navy Yard	99.2	98.1	98.2	96.7	3/13/31
Augusta (CL31)	Newport News S.B.&D.D. Co.					Comm. 1/30/31
New Orleans (CL32)	New York Navy Yard	6.5	3.3	4.6	2.3	6/2/33
Portland (CL33)	Bethlehem S. B. Corp. (Fore River)	36.8	26.1	33.5	22.2	8/15/32
Astoria (CL34)	Puget Sound Navy Yard	6.6	2.	6.2	1.7	10/2/33
Indianapolis (CL35)	New York Shipbuilding Co.	43.8	41.4	40.3	37.3	8/15/32
Minneapolis (CL36)	Philadelphia Navy Yard	2.4	1.4	2.	.8	10/2/33
CL38	Mare Island Navy Yard	1.5	.6	.4	.3	2/11/34
AIRCRAFT CARRIER						
Ranger (CV4)	Newport News S.B.&D.D. Co.	—	—	—	—	5/1/34
FLEET SUBMARINE						
V-7	Portsmouth Navy Yard	29.	28.	25.	24.2	8/1/32

Authorized by act of August 29, 1916
12 Destroyers Nos. 348 to 359 inclusive—no funds for construction.
1 Transport No. 2—no funds for construction.
2 Fleet submarines Nos. 170 and 171.
1 Neff submarine No. 108—no funds for construction.
Authorized by act of February 13, 1929.
9 Light cruisers.

Nine of Our Latest Submarines Receive Names

The New York *Times*, February 24.—Names were assigned to nine fleet submarines by the Navy Department today in place of designation by letters and numbers, the change being a return to the original policy of the Navy. No change, however, is contemplated for the present in the designations of the R- and S-type submarines.

Those to which names were assigned today were *V-1* to *9*. They were named, in order, the *Barracuda, Bass, Bonita, Argonaut, Narwhal, Nautilus, Dolphin, Cachalot,* and *Cuttlefish.*

V-1 to *6* are operating with Submarine Division 20 of the battle fleet. *V-7* is under construction at the Portsmouth Navy Yard. A contract for building *V-8* was awarded last week to the same yard and bids for constructing *V-9* will be received from private yards on April 16.

The *Barracuda* is the second submarine so named. The first was commissioned in 1908.

The *Bonita* is the third naval vessel of that name. The first was a 76-ton vessel purchased in 1846 and sold in 1849.

The *Narwhal* is the second submarine of that name. The first was commissioned in 1906.

The *Nautilus* is the third naval vessel of that name. The first was a vessel of 185 tons carrying twelve guns, and served in the war of 1812.

The *Dolphin* is the fifth naval vessel of that name. The first was a cutter of ten guns serving in the Navy of the Revolutionary War.

The *Cachalot* is the second submarine of the same name.

The *Cuttlefish* is the second submarine of that name. The first was commissioned in 1904.

New York Ship Low Bidder

Nautical Gazette, February 21.—The bid of $10,450,000 made by the New York Shipbuilding Company, of Camden, N.J., for construction of Light Cruiser No. 37 was lowest and contract has been let to this yard by the Navy. This yard guaranteed completion within thirty-six months of date of contract. Cruiser No. 37, as the vessel is designated, is the last of the light cruisers the United States may lay down until 1933 under provision of the London Naval Treaty.

There were two other bids submitted, Newport News at $11,300,000 and the Bethlehem Shipbuilding Corporation, Fore River plant, $10,695,000. Bids were opened in Washington February 12.

Naval Men Doubt Airship War Value

The New York *Times*, February 24.—The experiences of the dirigible *Los Angeles* in

the recent battle problem between the "Black" and "Blue" fleets have but served to strengthen the belief long held by many naval line officers that the value of the dirigible in naval warfare is dubious.

Though lighter-than-air craft experts believe the showing made by the dirigible was commendable, the majority of other naval officers though realizing that the *Los Angeles* is a bit of an experimental ship, credit the dirigible with little or no aid in the solution of the problem, and, as one officer expressed it, would rather have the money expended on her construction utilized in the building of surface ships such as destroyers.

Though the airship apparently has greater range of visibility than a ship and can cover from an altitude of 2,000 or 2,500 feet, a strip of water from 70 to 100 miles wide, it is said that because of her huge bulk the *Los Angeles* can be seen by surface ships as quickly as she sees them.

Dirigible experts contend the airship has a better opportunity for successful scouting than the airplane because there are more eyes to search the sea in the *Los Angeles* and her greater stability makes search easier. In the recent problem, however, the airship was sighted by an "enemy" destroyer which was not sighted by her.

It is also pointed out that main body of the "enemy" was located by planes despite the greater cruising radius of the dirigible. The advocates of the utility of the airship in naval warfare say this was because the *Los Angeles* had two sections to cover in neither of which the "enemy" happened to be at the time search was made. Her negative information, that is, information to the effect that the "enemy" was not in these areas, is felt to be of some value despite the lack of contact.

When the *Los Angeles* finally did sight the main body of the "enemy" after its location had been previously reported by planes and surface ships, the dirigible was immediately "destroyed."

The surface officers say the slow speed and huge bulk of the airship, which makes her a shining target for antiaircraft guns, and her practical defenselessness against enemy planes render her extremely vulnerable and virtually certain of destruction.

The airship officers admit this but say that contact with the enemy and information of his forces and movements is worth the sacrifice of a dirigible. They add that in future airships provision will be made for defense so that it will not be so easy to destroy them.

Surface officers in summing up declare that if the dirigible is of no use in scouting and has not yet proven its military search value, it has little or no naval utility except possible future adaptation as an air transport. The experiment, it is said, is an extensive one which has as yet produced little of war value.

In refutation of these beliefs enthusiastic air officers declare that the *Los Angeles* is of great value as a long-range scout due to her long cruising radius. Though she is admittedly an experimental ship, in the recent problem she was allowed a range of about 2,000 miles and for the purposes of problem it was estimated that she could cruise at an average speed of thirty-six knots for forty-eight hours. At this speed and allowing good visibility, she could cover about 3,000 square miles of sea each hour, far larger than the area covered by the scouting surface ship.

Airship enthusiasts say that the ship of the future, the *Akron*, now nearing completion, will use her five fighting planes carried in a hangar inside her hull to ward off an attack by enemy planes when contact with the enemy is made. Her machine guns will also assist in the defense, and the higher speed of the *Akron* will enable her to flee down the wind or take refuge in a cloud bank and thus tire out or elude pursuing planes.

Though there is decided disagreement in the Navy about the value of the dirigible, the use of the *Los Angeles* in the recent problem undoubtedly increased the knowledge of the officers and crew of the ship and helped to solve some of the difficulties of operating airships in the tropics, where great heat at midday and cool winds at night cause the sudden expansion and contraction of helium, the ship's lifting gas. The problem also showed the need, if airship construction and utilization with the fleet is to continue, of more mooring masts or mobile bases for dirigibles.

Though the problem of operation of the airship in the tropics or elsewhere has certainly not been solved in detail, yet the experiences the *Los Angeles* had in the "war," when she successfully avoided or flew

through sudden rain squalls, show that some progress has undoubtedly been made.

Report on Battleship Value

The New York *Times*, February 26.—Admiral William V. Pratt, Chief of Naval Operations and ranking officer of the American Navy ashore, has reported to Chairman Fred A. Britten of the House Naval Committee that the consensus among officers who attended the fleet maneuvers off the Pacific Coast of Central America is that air attacks were "of less value as a means of defense against approaching fleets" than had been expected.

Admiral Pratt also reported that it would be "impossible to successfully resist a descent on our coasts without battleship strength and auxiliary surface vessels in sufficient numbers to constitute a balanced fleet."

Rear Admiral Joseph M. Reeves, in command of the aircraft squadrons which assisted in the defense of the Panama Canal against the invading fleet, in a separate report to Chairman Britten declared that the air force alone "cannot stop the advance of battleships" and "prevent them from carrying out landing operations."

In making public summaries of both the Pratt and Reeves reports today, Chairman Britten remarked with a smile:

"It is interesting to note that even the aviation enthusiasts of the Navy now admit the superiority of the battleships."

We Will Wait to Build

New York *Times*, February 22. By Edwin L. James.—When Congress adjourns on March 4 without passing the naval construction bill carrying provision of $74,000,000 to begin the arduous and expensive task of building our war fleet up to the standards set in the London Naval Treaty, European statesmen will begin going through their files to read again the solemn declarations of our delegates to the London conference. They told the world that the people of the United States, for reasons of vital national defense, needed as large a navy as the British Empire, burned with a desire to have it, and would accept no less. Britain agreed to keep her Navy at its level until we caught up. And now the representatives of our people, whose great national thought a year ago was to have a navy equal to any, do not put up the money to build the first slice of the shortage between us and Britain.

It will take us a long time at this rate to spend the $1,000,000,000 necessary to catch up with Britain. It may be that when the scheduled naval conference of 1935 opens, we will again be there with our plea that Britain hold still until we can build to equal her fleet. It may well be that this program contributes to the reduction of naval armaments. If you reduce a part, you reduce the whole. But it will scarcely lend weight to our claim that our people must have a navy equal to any. It will be recalled that at the Geneva Naval Conference of 1926, Britain refused to come down to our figures. She repeated the refusal at London last year. She will probably repeat it again in 1935.

Just about a year ago the New York *Times* published a dispatch from London saying that it was the bet of the British admirals that the United States would not build the fleet called for in the figures under discussion. Mr. Brisbane wrote a sharp editorial asking how any one could thus reflect on the patriotism of the Congress of the United States. But that was a year ago.

It was also about a year ago that the members of the American delegation to London became irritated over a statement by an Italian delegate that the American case and the Italian case were most similar; that Italy had no intention of building up to the French fleet, but, for political purposes, wished her right to do so recognized by the participating nations; that the United States did not really need a fleet as large as Britain's, but, for political purposes, wished to be placed on the same rank. The Italian may now begin to think he was right.

It will not displease the British Admiralty that the Congress confine its naval appropriations to voting $30,000,000 for the modernization of capital ships. The British thought that the big result of the London conference was the virtual abolition of the battleship. Prime Minister MacDonald wished the principle of the ultimate elimination of the capital ship adopted, but the American delegation refused, taking the position that the battleship was the backbone of our fleet and that backbone must not be broken.

Yet, the ten-year holiday in battleship construction voted at the Washington naval conference in 1921-22 was extended for five

years. This means that in 1935 there will be less than a dozen battleships in the whole world under the theoretical term of usefulness of twenty years. And that means just one thing, if it does not mean the end of the battleship. It signifies that in 1935 the United States and Britain must launch a program for the construction of a billion dollars' worth of 35,000-ton floating fortresses. And they must do that at a disarmament conference!

The British persist in their belief that another 35,000-ton warship will never be built because they have outlived their usefulness. And it stands to reason they would rather see us spend $30,000,000 on our old battleships than carry out a program of construction of what they regard as more modern tools of naval warfare.

GREAT BRITAIN

New Destroyers Completing

London *Times*, February 6.—From now until the end of April one flotilla leader and ten new destroyers will be completed for service by private shipyards in Great Britain. Two of these are for the Canadian Navy, the *Saguenay* and *Skeena*, and are due to be finished in March and April respectively. The others all belong to the 1928 naval program. Their completion will result in a big loss of work to the private yards, as the program of the next year was cut down to one leader and four destroyers, and two of the latter were transferred to the public yards, leaving only three ships for the contractors out of the nine originally approved by Parliament.

The flotilla leader is the *Keith*, completing at Vickers-Armstrongs, Limited, Barrow. When ready she is to replace the *Broke* in the Fourth Flotilla, Mediterranean Fleet, into which the eight destroyers are also to be drafted. The first ship, the *Blanche* (Hawthorn, Leslie, and Co., Newcastle), should be finished on February 14. Five days later the *Brilliant* is due for completion by another Tyne firm, Swan Hunter and Wigham Richardson, Limited; and on the twentieth yet another Tyne yard, that of the Palmers' Shipbuilding Company, should finish the *Boreas*. The first of two vessels ordered on the Clyde, the *Basilisk*, is due for delivery from John Brown's yard early next month. Three more Tyne destroyers are due in March, the *Boadicea*, *Brazen*, and *Bulldog*, the last named on the twenty-sixth; and the group should be completed when the *Beagle* goes to sea from the Clyde in April.

Australian Submarines

London *Times*, January 22.—The Secretary of the Admiralty announces that an offer has been received from the Commonwealth of Australia to transfer from the Royal Australian Navy to the Royal Navy the submarines *Otway* and *Oxley*, which were completed in 1927. The offer has been accepted and the submarines will shortly join the Mediterranean Fleet, taking the place of older submarines, two of which will now be scrapped.

The *Otway* and *Oxley* will fit in well with contemporary submarines in the Royal Navy, as their design is similar to that of the "O" class, the first of which, the *Oberon*, is shortly to go to the Mediterranean from Portsmouth. They were authorized as part of the Australian post-war replacement program in 1924, and were built by Vickers-Armstrongs, Limited, at Barrow. They made the voyage out to Australia under their own power in 1928. Rough weather was experienced between England and Gibraltar, and some constructional weakness which developed in the engine columns of the vessels was made good at Malta. Six other vessels of the "O" class were laid down for the Royal Navy in 1927 and completed in 1929. They are now serving on the China station.

Owing to the stringent necessity for economy, the *Otway* and *Oxley* were paid off into reserve on May 10 of last year, at Sydney. They have a displacement of 1,535 tons, and an armament of one 4-inch, one smaller gun, and eight torpedo tubes. On the surface, oil engines of 3,000 horsepower give them a speed of fifteen and one-half knots, under water they have electric motors of 1,350 horsepower capable of a speed of nine knots. Their names commemorate Captain Albany Otway, R.N., who was president of the Transport Board in the early nineteenth century, and after whom Cape Otway, in Victoria, was named; and Captain Oxley, one of the early surveyors-general of New South Wales who was also a noted explorer.

The English-Speaking Navies

The Naval and Military Record, February 4.—The visit of the commander in chief of the British Atlantic Fleet to the commander in chief of the United States Battle Fleet is a very opportune event, as approximately coinciding with the first anniversary of the opening of the naval conference in London. The practical results of that conference have left a good deal of doubt, and probably it is true to add, a considerable amount of dissatisfaction in the national minds on both sides of the Atlantic. The big Navy orators

in the United States have demonstrated by protests, if not by facts, that Great Britain has got the best of the deal as usual. The converse task has been much easier on this side, for simple figures prove that the United States is very substantially increasing her fleet whilst we are very substantially reducing ours. "Parity," "yardstick," and such like terms have come rather to jar upon British ears as conveying a reminder of the surrender of that numerical superiority in sea power which we have traditionally regarded as so essential to the safeguarding of our world-wide empire, and particularly to the protection of those trade routes upon the freedom of which the inhabitants of these islands are entirely dependent for their daily bread and meat.

Under these conditions there is apt to be some confusion of thought, some wrong association of ideas. A new rivalry seems to have been born between the American and British navies. But the invitation of the American commander in chief to the British commander in chief may well serve as a reminder that this rivalry is of political birth and not of naval origin at all. That it should extend to, and be reflected in, the respective navies is inevitable, but—and this is the point—it did not emanate from those navies. The British Navy has not—at any rate for a good many decades past—bracketed the American Navy amongst the friends of today who may be the enemies of tomorrow. The American Navy quite clearly realizes this. Both services had their own great jobs, only one happened to be the greater of the two and therefore necessitated the bigger machinery for carrying it out. But there was no idea of conflict of interest between these great jobs until the basso politicians, seeking new limelight spots, discovered that American prestige demanded a remedy for a state of things under which the Stars and Stripes were hoisted over a lesser naval tonnage than the White Ensign.

In this country there is a pretty clear understanding of the American demand for naval parity. It was the demand of a very small minority, but, as it touched national sentiment, it awakened response in the national mind. That the American Navy should be gratified at the promise that it should cease to stand second on the list of world sea powers is natural enough. Whether until the politicians launched forth, the American Navy had ever thought of itself as second to a sea power which never showed the least reference to its own programs or policy is another matter. But whilst, as we say, the American point of view is pretty well realized in this country, it is very doubtful whether the British point of view is understood in the United States. When Mr. Ramsay MacDonald during the course of his American tour, appealed for tolerance and sympathy towards the British in their attachment to their navy, "because our navy is us," he was touching a wholly unnecessary note of humility.

In our view nothing could be better calculated to recall to American popular opinion that there is a British point of view and that this is worth discovering amidst the clouds of misrepresentation shed by such people as Mr. William Shearer, than the visit of the *Nelson* and *Rodney* to the United States Battle Fleet. The camaraderie of the sea is so much more refreshing than the calumny of the political platform. The "blood is thicker than water" incident lingers in memory and will go on lingering after the name of Shearer has returned to absolute oblivion. All international naval treaties are a mistake, and particularly when they dictate national limitations irrespective of national needs. The United States could quite well have built whatever fleet she considered she wanted and we could have reduced our fleet as we thought expedient without any formal "by your leave" on either side. But since gesturing statesmen have matched reputation by putting these matters into contract form, we must make the best of what might easily become a source of serious friction. Friendliness between the British and American navies is very much better than "yardsticking," and reduces all idea of the process to a sheer farce.

FRANCE

The "Aigle"

The New York *Times*, February 19.—The *Aigle*, which is expected to be the fastest ship in the French Navy, was launched today at Dunkirk by Charles Dumont, Minister of Marine.

The *Aigle* is one of the six destroyers laid down in the 1927 program. She will be put in service by the end of the year and an attempt will be made by her to beat the speed record for vessels of her class.

The speed contests began when the *Guepard* was beaten by the *Valmy* and the *Valmy* in turn was beaten by the *Verdun* and the *Vauban* which have done more than forty miles an hour. The French say their destroyer flotilla is the fastest in the world.

The *Aigle* has a displacement of 2,610 tons, is 423.5 feet long and can develop a speed of 40-knots from engines which give 70,000 horsepower. She will carry five 138-millimeter guns, four antiaircraft guns and six torpedo tubes. She will be under the command of Captain Rouyer.

Antiaircraft Defense

The Naval and Military Record, February 11.—There is no weapon, however powerful, that does not in due time meet with a counteracting antidote. The flying machine, though whirling through space at a terrific rate and seemingly possessing means to promptly get out of range, has become more vulnerable than is generally realized to modern A.A. guns and projectiles, either from the ground or from the decks of ships. In 1914 aëroplanes and seaplanes took the military world by surprise. The French Army was caught totally unprepared by air bombing. At first ordinary 75-mil. field guns were used, with poor results, against sky targets. In 1915 special A.A. guns on motor trucks were fitted and in 1916 improved control and sighting appliances were being tested. In 1917 and 1918 improvements had been so great that, whereas 100,000 rounds were in 1915 necessary to bring down an enemy plane, the same result was achieved in 1917 with 10,000 rounds and with only 3,000 rounds in 1918, though flying machines could fly much faster and higher. Since then the art of A.A. defense has steadily progressed. The newest A.A. guns of the French Army (and also of the Navy) fire eight kilo shells with a 900-meter-second velocity; they are utilized in groups instantaneously, electrically controlled, concentrated, and fired on a target. Realistic experiments have shown that fighting planes, especially flying in group formation, will run great risks, all the more so as the exploding radius of new shells is very great. Similarly, A.A. machine guns of a new type, firing up to 800 rounds per minute and electrically controlled, with range exceeding 6,600 yards, have recently been tested with success.

Greater dangers are in store for tomorrow for the flying world with the electric guns now being experimented upon, the muzzle velocity of which will exceed 5,000 meters per second, fitted with special fuses and striking the target almost instantaneously. French frontier barrage fortifications and all French ports militaires are to be provided with groups of eight such A.A. electric guns under armor. A single officer and eleven men will control and handle each group of guns, instantly directing with practically perfect accuracy a hurricane of deadly shells on any aërial target. Officers of the D.C.A. (defense *contre avions*) smile when the wholesale destruction of cities by German aërial fleets is mentioned to them. Giant flying machines with 50 meters span and 30 meters length, like the *Do-X*, will not have everything their own way. French experts have done much in antiaërial research. German savants are reckoned to have done at least as much. Progress and efficiency are synonymous terms.

The advance being made by Army experts in A.A. defense will benefit the Navy. The A.A. armament of French ships, several times modified since the war, will be further improved as the result of experiments at Gavres and on board certain vessels in the Mediterranean Fleet. Changes will have to be made in the distribution of A.A. quick-firers, the number of which is to be increased to cope with the growing aërial danger. A new branch of specialists is to be created. Shells filled with incendiary or smoke-producing liquid (as experimented upon in Germany) are more to be feared than ordinary explosive shells, as they will interfere with gun firing.

ITALY

Forty-Ton Stabilizer for Destroyer

Marine Age, February 15.—An order from the Sperry Gyroscope Company of New York, for the manufacture of a gyroscopic stabilizer and electric control equipment specified by the Italian Ministry of Marine for an Italian warship, is announced by the Westinghouse Electric and Manufacturing Company.

The stabilizer which prevents the vessel from rolling, is to be installed in the new 2,000-ton destroyer leader *Pigafetta,* now building at Spezia, Italy. The gyroscopic wheel of the machine will weigh 33,000

pounds, is seven and a half feet in diameter and with its case, complete equipment will weigh forty tons. When running at 1,350 revolutions per minute, the stabilizer will hold the vessel to within two or three degrees maximum roll in the severest weather.

Use of the device, naval experts point out, will afford a steadier deck platform for gun training, range findings, and better steering qualities in a seaway, so essential in a light, high-speed warship. In addition, the elimination of the roll will reduce the fatigue which a person consciously or subconsciously suffers on a vessel in a seaway, thus keeping the personnel at a higher pitch of physical and mental alertness.

GERMANY

New Cruiser

London *Times*, February 4.—The new German ship *Bremse*, launched a few days ago, is of a novel type. Although nominally a gunnery school ship, with a displacement of only 1,425 tons, or about that of a sloop, she is designed for twenty-seven knots, or the speed of a cruiser, with oil engines as her propelling machinery. According to Brassey's "Annual," the *Bremse* is due to be finished this year. She takes the name of a German mine-laying cruiser built during the war, one of the two which raided the Scandinavian convoy in October, 1917, and sank the escorting destroyers *Mary Rose* and *Strongbow*. The *Bremse* was among the German ships surrendered in November, 1918, and seven months later was scuttled at Scapa Flow.

MERCHANT MARINE

Report of Committee on Training Personnel

Marine Age, February 1. By Rear Admiral H. I. Cone, U. S. Navy (Retired), Chairman.—The third national conference on the Merchant Marine, held in Washington, D.C., April 23-24, 1930, appointed a committee for the purpose of studying the subject of training personnel to serve as merchant marine officers.

This committee held its first meeting on June 6, 1930, and has been actively engaged since that date in securing information and formulating ideas necessary for the preparation of this report. After several meetings of the committee, it was determined to submit a questionnaire to the maritime interests of the country, educational institutions, chambers of commerce, labor organizations, licensed officer personnel of our merchant marine, War, Navy, and Commerce Departments of our government, as well as such others in the industry that it was thought might have valuable ideas on the subject.

Approximately 7,500 questionnaires were mailed. About 3,700 replies have been returned, and we are still receiving replies. After a careful study of the returns, your committee believes that sufficient have been received to give a fair idea of the concensus of opinion of the above mentioned interests.

It is to be noted that of the 3,700 returns, 1,100 were returned unanswered, mostly from chambers of commerce and educational institutions, which would seem to indicate to those of us engaged in this work, that missionary work in this field is much needed to interest such institutions in our merchant marine.

Of the number received, the committee has tabulated 1,730 of the answers to the questionnaire, representing practically all the various maritime interests mentioned above. A copy of this tabulation is attached to the committee's report.

In addition to filling out the questionnaires, in many cases, letters have been received from those interested giving their ideas in detail, and in some cases suggesting plans for establishing educational institutions and methods, some of which are most interesting and will be invaluable to those who have in charge the carrying out of any plan finally settled upon.

The committee reports that from the findings of the questionnaire, there should be a national system for the training of officers. Naval Academy and Coast Guard academies as training schools for merchant marine officers are not favored. The strong consensus of opinion is that a national merchant marine academy shore station should be established, devoted exclusively to training men of proper qualifications and supplemented by training ships. Whatever plan may be adopted, no man should be denied the opportunity to qualify himself for a license by means of service through the lower grades on deck and in the engine-room.

It is evident from the answers that a large majority believes that the question is one that should be handled by the federal government, but in answer to other questions, it

was indicated that it would be advisable to retain the state school ships until such a system was in operation. It is clearly indicated that the adoption of any new system should not interfere to the prejudice of any man working his way through the ship.

Strange as it may seem, sailing ships as training ships do not appear to meet with much favor, especially from the licensed personnel afloat; the combination of cargo and passenger ship is believed to be the proper modern medium for training.

Machine shop, electric drive, Diesel engine, shipyard, marine engineering and boiler manufacturing plant, electricity and refrigerator experience is deemed very desirable for the training of licensed engineers.

As to educational qualifications to be required before entrance, it is clearly indicated that at least a grammar-school education should be required.

As to instructors for such a school, it was thought that the best men available should be procured, although previous training in the merchant marine would be deemed most advantageous.

It was deemed to be highly desirable to raise the educational qualifications of the present licensed officers by giving further courses of instruction, but the matter of subjects and the means for carrying out such education should be further developed.

In view of the foregoing, the committee believes that a satisfactory start has been made looking toward the solution of this most important problem, and therefore recommends that the United States Shipping Board, in coöperation with the Department of Commerce and the maritime interests, take such steps looking toward the establishment of a national mercantile marine educational system as may be practicable.

The committee believes that the answers heretofore submitted to its questionnaire are sufficiently comprehensive to cover the situation, and that this committee should now be discharged at the pleasure of this conference.

As chairman of this committee, I desire to express my appreciation of the hearty cooperation of its membership in the duty with which it was charged, and I trust that I may be permitted to express my further appreciation to all persons to whom this questionnaire was sent for the thought and labor given by them in furthering the work of the committee. The answers received clearly indicate an aroused public sentiment in this country in favor of a merchant marine and an educated officer personnel, and that further effort should be directed toward informing chambers of commerce and educational institutions in general of the importance of this work.

Liquidation Activities of Merchant Fleet Corporation

The Nautical Gazette, February 21. By J. Caldwell Jenkins.—In recent years when lines are not so finely drawn upon great and sundry issues, there has grown up more or less two groups in the public eye, one which continually "views with alarm," and the other which always "points with pride," the same difference there is as between the pessimist and the optimist. Whatever I may say about the activities of the Shipping Board and its subordinate organization, the Merchant Fleet Corporation, in the development of an American Merchant Marine necessarily and unavoidably places me in the category of those who point with pride.

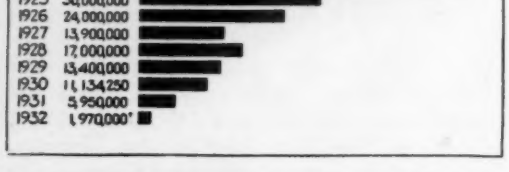
It is not my purpose to say anything concerning the need for an American Merchant Marine or to deal with the broad aspects of public policy affecting it, because such questions are already pretty clearly settled in the minds of those who have been active in guiding its course. It seems certain, however, that the passage of the Jones-White Act has acted as a sort of gyroscope to stabilize and steady the old ship that has come through so many storms in years just gone by. It gave us a new starting point.

To me has been assigned the subject of "Liquidation Activities of the Merchant Fleet Corporation." Of course, the activities of the Merchant Fleet Corporation have not always been liquidation, because in the early years we had nothing to liquidate except some materials left over from the war activities and not needed for our merchant marine program of development.

Conditions were such around 1920 that it was impossible to find private individuals who would undertake the establishment and maintenance of a single one of the lines necessary for our commercial and national defense. It had been three-quarters of a century since the United States had had any considerable number of vessels engaged in

foreign trade. Lack of familiarity with, and the lack of training and entrenchment in, the business was in my opinion, our greatest handicap, second only to that resulting from higher shipbuilding costs in the United States.

For there were practically no American owners in the foreign trade and we did not even have a sufficient number of ship operators in this country who had any sort of experience in the highly competitive trades;



THE FIRST TWO FIGURES, 1923 AND 1924, INCLUDE LIQUIDATION EXPENSE ALLOWANCE. 1932 FIGURE IS PROPOSED APPROPRIATION

so that the problem before we could liquidate was one of establishing strategic trade routes and to develop private ship operators who would ultimately become the owners.

The liquidation of the property and the functions of the Merchant Fleet Corporation that are of greatest significance to the American Merchant Marine do not consist in dismantling of ships or suspension of actual ship operation, but consist rather in the surrender to private steamship companies of activities which the government has heretofore been carrying on. It has been unfortunate in the past that the word "liquidation" has been so universally applied to the work which the Shipping Board was trying to accomplish, because it had a demoralizing effect with those who attached to it the usually accepted meaning of going out of business. It lowered the morale of our personnel and left with the competitor the feeling that we were not going ahead with the things which now we really have accomplished.

The main business of the Merchant Fleet Corporation until comparatively recently was, therefore, the operation of government ships over some thirty-eight trade routes as effectively and economically as possible, but from first to last the organization and methods followed by the board were those which it was felt would gradually facilitate the eventful transfer of the vessels and lines to private ship companies.

Aside from recommending to Congress the passage of legislation which would aid shipping, the main purposes of the Shipping Board and Fleet Corporation were to help the merchant marine get on its feet, first by establishing services around which there could be built up an active freight and passenger business, and second, in so organizing its efforts along this line that in the process there would be developed shipping companies and personnel experienced and competent to take over the lines when other conditions were such as to permit. In practice, the measures taken to assure the development of competent ship operators have to an increasingly large extent been the means by which we have brought the lines themselves to their present state of development.

The success which the Shipping Board has met with in recent years in the sale of lines is too well known to need detailed treatment. Out of an original number of thirty-eight lines, twenty-five have been sold or are in process of sale. It will probably be remembered by some that the sale of our lines began as early as 1924, in which year that great pioneer in American shipping, Robert Dollar, bought vessels to establish the round-the-world service, and the Grace Company bought a line of fourteen cargo ships. A recent rearrangement and regrouping leaves the board with thirteen lines of nine operating units involving some 175 vessels. The very success of ship sales efforts in the past have, however, altered the nature of the liquidation problem for the future, and made it incumbent upon the corporation to adopt new methods if the process is to be carried forward to completion.

Naturally the more profitable lines were the first to be taken over. All the passenger lines have now been sold and all the lines operating from the Pacific Coast. With those remaining the difficulties of getting out of the red figures into the black are greater than formerly, even with the Jones-White mail aid, and an unusually high level of operating efficiency is requisite if the lines are to be made to pay.

Primarily to encourage greater efficiency and secondarily because of the savings which it means to the Fleet Corporation itself, and also to stimulate the sale of established lines

we have within the last year put into effect what is known as the lump-sum operating agreement. This new agreement and form of operation places the managing operator on a basis as near to ownership as can be without actual title transfer of the lines.

Now I would like to say a few words in explanation of just what is meant by the lump-sum agreement between the managing agent and the Shipping Board for the operation of government lines, because I believe that one of its main virtues is that it is the forerunner of liquidation or transfer to private capital.

Up until about a year ago the established plan of operating Shipping Board vessels involved compensating the managing operator on the basis of a commission on gross freight and passenger revenue, usually 7.5 per cent on all outward cargo and 3.5 per cent on inward. Although the operator had charge of all details of operation, he had no financial incentive to keep down the cost thereof. A dollar spent which should not have been spent meant no monetary loss to him. The only thing that the operator was concerned with beyond his natural pride in the success of the venture was the commissions on cargo obtained, and even this as an incentive was not always adequate to encourage the operator to do his utmost to obtain traffic.

Even as good as our ship operators are, the mind has not yet reached that degree of efficiency that it can entirely dominate the instincts of mankind, and so with operators, as with the rest of us, self-preservation was the first law of nature.

The result was that the Merchant Fleet Corporation had to maintain practically a duplicate organization to oversee, check up, and visé almost everything that the operator did. Only a few years ago the Fleet Corporation had a pay roll of over six million dollars per annum to do this thing—an overhead that was greater than the total of the overhead of all operators put together. This manifestly was no longer an ideal way of developing management by private shipping companies although it had been justified in the earlier days when the problem was one primarily of intensive training and development of American operators who could ultimately become owners.

So we set about to formulate some new agreement and operating plan that would put the operator on his own; that would let him conduct the business pretty much as he would do if it were his own property, and at the same time protect the government's aims and purposes in every possible respect. This new operating policy completely changed the underlying structure of our operation. It was a radical change which some said was a *donation* while others called it a *crucifixion*, depending upon the viewpoint. You may be assured that it was well considered before we got started.

The lump-sum agreement abolishes cost plus commissions, the only financial obligation of the Shipping Board being an agreement to pay a specific lump-sum amount for each of the stipulated number of voyages, The operator must make the voyages at his own expense and must maintain the vessels in a good state of repair within certain limitation. The operator retains all revenues, which when added to the lump-sum payment should enable him to cover his expense of operation and administration and earn a fair profit for himself, but if he does not, it is his own loss.

We have based the lump-sum figure on the prospective gross revenue and operating costs of the lines, taking into consideration their past experience. If, however, the operations reach the point where the operator is making an excessive profit, we have reserved the right in the contract to readjust his lump-sum figures accordingly. The result generally is, though, that he comes in and wants to buy before we have a chance to readjust. He is, however, still required to furnish stipulated reports of his operations which are scrutinized by our experts in order to keep a check on the progress of the operation, and we make periodical inspections of the ships as to upkeep to make certain that he is rendering specific service to the shippers. But we do not interfere with his business.

Whatever may be the exact figures arrived at for the lump-sum payment, it always represents a financial saving to the government. For instance, voyages that approximated under the former plan the total cost of $11,000 are reduced under the present plan to about $7,000 per voyage, representing a saving of $4,000, which is because of our ability to eliminate the large overhead which the Fleet Corporation has had in the past of around 15 per cent of the total cost of operation. We can do this because we

no longer need to duplicate the work that the operator is doing for us. We no longer need to tell him whether he can take certain traffic and at what rate, nor do we have to supervise the stevedoring, the maintenance of the ship, the purchase of supplies, or the turn-arounds. In short, it can be said that even those who were originally most skeptical concerning this agreement are now highly enthusiastic in the face of evident success. The plan is successful also because now the operator is concerned with the money that goes into the operation for every nickel that is spent recklessly comes out of his own pocket.

From the standpoint of liquidation, therefore, the significance of the lump-sum agreement lies, first, in the great reductions which it makes possible in the overhead of the Fleet Corporation, second, in the more realistic experience which it gives Shipping Board operaters, and the stimulus which it offers them to put their lines in such shape that they not only can buy them but will be eager to do so. It puts the whole shipping business more fully on private footing.

In this respect, one of the stimulating conditions of the agreement is that the board within its discretion gives the operator the preference in the future sale of the line. What could be sounder than that principle which recognizes that the operating organization which has successfully developed and established the steamship service can best be entrusted with its future management and permanence and to develop the line to a point where it will become a real competitor in the foreign trade. In conformity with this policy, in very recent sales of lines we have sat across the table with the operator and worked out a sales price based upon the commercial value of the line on a permanent basis, so that the purchaser does not go forth with a millstone around his neck to begin with.

There is another thing that I would speak about. In the transfer of these government activities to private shipowners much of the personnel of the parent company, the Fleet Corporation, has been absorbed in the new operation. Too much praise cannot be given to the large and efficient organization all along the line that really does the work and which for many years has been liquidating itself out of a job. The one compensating feature is that these private companies as they take over new lines and enlarge their activities will more and more absorb the men who have been trained in the Fleet Corporation to do the work.

Years ago our steamship fraternity was a very close corporation. That is to say, they sort of felt that a man had to be born on a ship, climb upon the docks, and make his way to an executive position before he could have any real idea of the all-practical problems of the ship industry. It is gratifying that this feeling has passed away and that now our steamship problem depends upon a correlation of the minds of statesmen, practical business executives, and technical shipping experts.

I used to meet up with a great deal of that sort of thing. I am reminded of a cartoon of Mutt and Jeff. It seems that Jeff was expatiating or talking about some very technical problem, finally Mutt said to him: "Well, what business have you got talking about this thing the way you do? You have never gone to college; you have never graduated in that thing, and you don't know anything about it." "Well," says Jeff, "that may be right. And I never laid an egg either, but I know a bad one when I see it."

With the several government aids held out in support of American owners which will bring about the construction of new and modern vessels, with the growing efficiency on the part of American owners and the increasing patronage by American shippers, we need have no fears for the permanency of these American lines that have been and are being transferred to private hands. All they will need is the support of American shippers, but incidentally I am not one of those who believe that we can wave the American flag and expect that shippers will use American vessels, unless they can obtain approximately the same service for the same price. Whenever we have reached that state of efficiency in personnel and in ships which enables us to furnish a service equal to the competitor, we should point the finger of scorn at the shipper who does not utilize the American ship and keep it pointed at him until he does ship the American way.

The transfer of our lines to private capital is merely a beginning. Recently the United States Lines, the show window of the American Merchant Marine, laid the keels for the first of two of the largest ships ever built

in this country. The Dollar Line on the West Coast has started building in a real way, and correspondingly the other lines which have been sold by the government have taken up seriously their future building needs.

It has been said that money talks. Sometimes the absence of it talks quite as forcibly. By reference to the annual appropriations of Congress for ship operation and expenses of the Merchant Fleet Corporation, we find that as late as 1928 Congress appropriated $17,000,000 for ship operation. In 1929 it was $3,000,000. Last year it was $10,000,000 and this year it is $6,000,000. For next year we have asked for $2,000,000. After all that is your liquidation story.

AVIATION

Organization of French Naval Aviation

La Revue Maritime, November, 1930.—(Note: This paper won the first prize in the Académie de Marine.) Naval aviation is generally divided into coastal aviation and shipboard aviation, but this classification really corresponds to the difference in the points of departure, rather than to any difference in the purposes for which they are used. For the present, coastal aviation is concerned with coast defense, but it is predicted that the development of aircraft will before long result in groups of long radius of action, able to participate in offensive operations on the high seas, a real autonomous fleet.

The problem of coast defense naturally involves a collaboration between the terrestrial coastal elements and the naval coastal elements. Those of the Navy constitute in a way, the advanced guard, the first line of defense, while those elements of the land constitute the second line. As a consequence of the importance, in modern war, of the mine and the submarine, the first line of defense tends to advance further and further from the coast.

One finds the same characteristics corresponding to these two lines of defense in coastal aviation, which may be separated into two groups. The first part will comprise the aircraft which guard the littoral and the channels leading to the ports, also the aircraft squadrons destined to attack surface ships in coastal waters. The second part will comprise squadrons of fighting planes charged with the defense of the ports, and coastal bases against aërial attack. The first group, composed of seaplanes or amphibians, has a rôle essentially naval. In the first place, its business is to patrol the sea in a manner similar to that of light vessels and coastal launches. All the elements of this group are of the naval character, armed to attack naval targets at sea. Their action tends to extend further from the coast the first line of defense, consequently rendering the littoral less directly vulnerable to the blows of the attacking naval force. The rôle of the combat squadrons is closely linked with the other elements of aërial defense on shore, that is, antiaircraft artillery, listening devices, etc. These squadrons would also be charged with the defense of any portion of the fleet at anchor in the harbor.

Whether aircraft be carried on the vessels of the fleet or on a special carrier, they are evidently destined for naval operations. The protection of aircraft carriers against enemy ships or submarines requires surface vessels armed with guns or torpedoes, which are in turn protected by the aircraft of the carriers. It is not too much to predict that the carrier will gradually transfer its light planes to the other vessels of the fleet, and that its heavy aircraft will tend to become autonomous. Embarked aviation will thus become more and more an integral part of the armament of all surface vessels.

At the present time, what may be called "aviation of the high seas," is composed of rigid airships and a few heavy seaplanes, but we believe there is a great development coming. There seems to be no limit which may be attained in the size of these craft, and the sea will furnish them ample landing space. Their sea-keeping qualities will improve with the increase in size, which permits us to imagine the aërial cruiser of the future —seaplanes or flying boats provided with exact means of navigation and radio, armed with torpedoes, bombs, and automatic cannons, cruising in squadrons which may anchor in sheltered bays, or even refueling at sea. The logical arm of these fast vessels will be the torpedo, and we believe that the present doctrine of employment of the torpedo, against ships in the battle line, will apply better to a flotilla of these craft than to a flotilla on the surface.

This autonomous seagoing aviation, as

nearly as we can foresee, will divide into aircraft cruisers and aircraft destroyers. The defense of the fleet against these craft will rest with the fighting planes carried on board the surface ships themselves, and these will necessarily be very numerous. As these fighting craft must be carried on surface ships, it follows that the command of the air, at sea, is directly linked and even subordinate, to the command of the sea.

Naval aviation is logically composed of the following parts: First, the seagoing elements of the aëronautical coast defenses (patrol of the sea front and attack of enemy ships near the coast). Second, embarked aviation, which must be assimilated as a particular arm of the surface ships and which constitutes the essential element for fighting enemy planes at sea. Third, autonomous squadrons destined to take part on the high seas in specifically naval operations, and which must be considered as flying naval forces.

On the other hand, it is logical to assign to the aërial defense army, all the fighting squadrons which defend the coasts against aërial attack, and also such bombing squadrons as are called upon to attack enemy ports from bases on our coasts, which may be the case in the narrow seas of Europe.

Naval aviation, thus limited and defined, is strictly dependent for its action, upon the other naval forces, the principal object being the defense of maritime communications. It follows that the purpose of naval aviation, whether embarked or autonomous, is identical with the object of the surface squadrons and the submarine squadrons.

The defense of maritime routes is the veritable object of naval aviation. It is useful to recall this fundamental truth, because some persons go so far as to pretend that future air lines can supplement the maritime routes and that the large aircraft will be able to contribute to the provisioning of a country whose maritime routes have been cut. This hypothesis would justify the creation of an independent air fleet over the sea and the land, for the defense of aërial routes.

It is easy to see that this hypothesis dreams of Utopia. The commercial aircraft cannot replace the cargo ship because the relative return for the power expended is incomparably less, and this confines aërial transport to the carriage of precious freight and rules out the carriage of such essentials as wheat and oil and other raw materials by which modern people and their industries live. The free use of maritime routes, that is, the command of the sea, therefore goes back to the command of the surface of the sea. In these days, command of the sea consists of command of the surface, of the water under the surface, and of the air above it.

Each country has its air problem, which depends primarily upon geographic, strategic, and even political situations. The United States does not need to fear attacks from the air, as their possible enemies live beyond wide oceans. They have, therefore, no use for an independent air force, but their naval aviation is exceptionally important.

England being an island, the Army is but slightly concerned in territorial defense, but there exists the peril from the air and the Royal Air Force tends to supplant the Army for territorial defense. The creation of the Royal Air Force has, however, considerably retarded the development of naval aviation which is certainly much behind that of America.

In Italy, the situation is practically the same, for the wall formed by the Alps, protecting the country against a terrestrial enemy almost as well as a channel of the sea, makes Italy practically an island from the strategic viewpoint.

In France the situation is quite different and the aërial problem is more complex. We are obliged, by reason of our frontiers on the north and east, to provide our Army with considerable auxiliary aviation, and the defense of our territory against a terrestrial enemy and an aërial enemy, are very closely related. It must be remembered that our aviation for territorial defense, is distinctly of a terrestrial character, because the aërial peril for our nation naturally proceeds from land bases.

The partisans of the Air Ministry invoke the lessons of the last war without thinking that naval aviation did not then exist. They also base their arguments on the unity of the technique of aviation and the superior reason of perfecting the material. But if the object of naval aviation is essentially naval and identical with that of the Navy, it must be commanded by the Navy, and it is useless to emphasize the grave conse-

quences which would result from divided command.

The organization of the Navy is entirely different from that of the Army. In the Army the different branches, artillery, infantry, cavalry, etc., are organized separately into battalions, regiments, and divisions, which must naturally coöperate in combat. Aviation is likewise constituted into regiments, brigades, or other important independent formations.

In the Navy the situation is different. The unity of command is the ship on board which the different specialities are intimately mixed to form the crew. An aircraft may be considered as a unit of combat possessing its crew also. The objects of naval aviation being essentially naval, its personnel must not only be aviators, but possess solid maritime instruction in order to be able to navigate over the sea, to identify the type of enemy war ships encountered, to recognize their tactical formation, to interpret the object of an observed maneuver, to attack with the torpedo or to lay a smoke screen. For the naval aviator and the officer on the bridge of a surface ship, the reflexes must be identical. Numerous examples from the World War show how costly was this lack of a naval education.

The creation of a corps of naval aviators appears to be the only possible means of adapting the air force to naval aviation. From the moment when independent flying boats are furnished the Navy, it will be necessary to separate their personnel from the aërial forces concerned with land operations, in order to link them with embarked aviation. Thus the independent air force will inevitably be split into two parts, territorial and maritime, the latter not only for the purpose of safeguarding their naval character, but also to assist in the progressive development of naval flying material.

But if the necessity of a corps of naval aviators grows out of the establishment of the air ministry, this corps will be submitted to the misfortunes of divided command. It will inevitably tend to separate from the Air Ministry and move toward the Navy. Thus it may result that naval aviation, being interposed between two authorities, will escape from both. These naval aviators originally from the Army of the Air, will never be assimilated into the naval organization on account of their different formation, different spirit, and insufficient maritime instruction.

In the seventeenth century, in order to fill the vacancies in ships' crews, at a time when artillery employment was increasing at sea, there was a considerable transfer of riflemen and artillery men from the army to the fleet. The result was so bad that it was soon necessary to form a corps of naval artillery, which has been gradually assimilated by the Navy.

To sum up, a single air force will be impossible without the constitution of a corps of naval aviators. At the same time such a solution presents grave difficulties. The best solution that can be made of it is to train a sufficient number of naval officers to fly, and that is what has been done in England and in Italy. This solution has also the advantage of economy. On board the British aircraft carriers, the number of officers required has by this means been reduced in the proportion of 18 to 11. Nevertheless, if these officers are taken into the Air Force, there will remain the evil of divided command.

It is evident that naval aëronautical material is becoming more and more different from aircraft employed on shore. Even the light craft carried on shipboard must be specially constructed, and for the heavy flying boats the difference is even more plainly marked. Furthermore, it is logical that the Navy should determine the qualities of its aircraft employed in naval missions. It is inadmissible that an essential arm of the Navy be built, outfitted, and manned by another department of the government. Plain common sense indicates that the only effective training of the personnel and the design of material for its special use can be attained only by the authority responsible for the execution of the mission.

Divided command is an even greater vice when it is introduced into an organization like the Navy, whose principle is unity of command. In the Army, mutual cöoperation exists between the various arms, and an independent air force, added to the other arms, would not seriously complicate the existing problems of cöoperation. Naval organization is based on the ship as a unit and the system of separation and cöoperation is not applicable.

Carbon Monoxide Tests

Bureau of Aëronautics, February 15.—Carbon monoxide poisoning from the exhaust fumes of airplane motors as a hazard to pilots of naval planes practically has been eliminated as the result of investigations made by the Bureau of Medicine and Surgery, in cöoperation with the Bureau of Aëronautics. As a result of the tests made, changes have been made in naval planes so that the hazard is eliminated above the breathing level of the cockpit, and further work is being carried out in order to eliminate all traces of the gas in the floor level of cockpits. The tests have been performed under direction of Lieutenant Commander J. J. White (M.C.) U. S. Navy, flight surgeon and director of aviation medicine, representing the Bureau of Medicine and Surgery, and Commander C. A. Pownall, U. S. Navy, chief of the engine section of the Bureau of Aëronautics.

During the investigation, every type of plane used by the Navy was tested and in only two types was found any absorption, by the occupants, of carbon monoxide gas—the two types being observation and bombing. These were carefully rechecked on several occasions, with different personnel. All personnel were checked before they made the flights and flights were of at least four hours continuous duration, which is more than the average continuous hop. In no case was absorption demonstrated to a dangerous degree.

Upon completion of this work with the absorption test, Commander Pownall took steps to have the exhaust leads of the different types of planes investigated. After modification of exhaust leads, the question apparently was solved, subsequent checks on occupants of the planes, as far as absorption was concerned, proved negative.

A special instrument, a carbon monoxide indicator, is now being completed, which will register the presence of gas as low as two-hundredths of one per cent. If this instrument proves practicable, it will be installed on the instrument board of the plane, in a manner similar to an oil pressure dial, and any presence of carbon monoxide can readily be noted by the pilot.

The Design of Aircraft Carriers

Army, Navy and Air Force Gazette, January 29.—A lecture on "Deck Flying" was delivered before the Royal Aëronautical Society in the lecture hall of the Royal Society of Arts on Thursday, January 22, by Squadron Leader W. R. D. Acland, D. F. C., A.F. C., of the Directorate of Operations and Intelligence, Air Ministry. Reference was made at the outset to the development of the seaplane carrier into the modern flush decked ship from which high performance aëroplanes can operate in almost any kind of weather. The design of the ship has throughout directly influenced the design of aircraft, until today a stage has been reached which within certain limits enables the fleets to use aëroplanes which are no longer hampered by extra strong undercarriages and appliances for picking up wires used with the original arresting gear.

Early in the war the *Vindex*, equipped with five seaplanes and two single-seater landplanes, was the first ship to be fitted with a forward hangar and flying deck. The *Furious*, first commissioned in 1917, was the first attempt at a floating aërodrome, a ship to which landplanes may return after flight. In her first state only a comparatively small part of the ship was available for aircraft and this was in the forward part of the ship. The flying deck consisted of the roof of the hangar extended to the bows and sloped downwards in order to give a clear flow of air over the deck. A run of over 200 feet was available. It was on this deck that the first attempts to land were made. Here the late Squadron Commander Dunning made the first successful landing on a ship under way and lost his life in a subsequent attempt to improve upon this first achievement. The method adopted was as follows:—The ship steamed head to wind so as to give as large a relative wind speed as possible. The pilot then flew past the ship as close as possible, drifted round the bridge and so arrived over the flying deck. He would then throttle down and allow the aircraft to sink on to the deck. There was no kind of gear to hold the machine on the deck once it was landed, but a party of officers and men were detailed to grab the aircraft as soon as it touched, and in the first successful landing it was actually caught hold of while still in the air. Squadron Commander Dunning realized that this was not practical and gave instuctions that on his second attempt the aircraft was not to be touched until after he was on the deck. In thus attempting to ar-

rive on the deck with his engine running he burst a tire, with the inevitable result that in the high relative wind the aircraft dropped a wing and slewed over the side before it could be reached and the pilot was drowned.

Experiments were subsequently carried out at the Isle of Grain, with an arresting gear, consisting of a number of fore and aft wires a few inches apart. The intention was that the pilot should let down a hook which would pick up successive transverse ropes as the aircraft ran down the deck, but in practice hopes were not realized. Air disturbances caused by the mast, bridge, and funnel made flight so bumpy that the pilot had to fly faster than would ordinarily have been necessary. Further, halfway down the deck the natural wind was so blanketed by the superstructure that it ceased to have any effect on the aircraft, which was thus deprived of a very large proportion of the relative wind. There was a high wastage of machines in the early attempts to land on the *Furious* and the *Argus*.

During the early trials in the *Argus* a canvas and wood structure representing a funnel and bridge was erected on the starboard side about amidships to find out if it would be possible to land with such a structure on either side of the deck. The advantages of having the funnels in this position instead of carrying them right aft were: (1) It made a much simpler proposition for the constructors; (2) the heat of the funnels did not render the hangars extremely hot as is the case with the funnels running aft; and (3) the width of the hangars was not restricted. No difficulty was experienced and so the first carrier to be constructed with an "island" was the *Eagle*, which was completed for trials. In this carrier the after end of the deck was curved down, a form now permanently adopted.

In 1924, fleet aircraft were still handicapped by the extra structural strength required merely to withstand the shock of landing into the wires and knocking down the supporting flaps which had replaced the wooden blocks for holding the wires up. Further, the deck hooks not only reduced the performance considerably, but also, by virtue of their catching up the wires and so exerting a force to keep the aircraft on a straight course when it was inclined to swing, so twisted the undercarriages that they were often strained or rendered so weak as to prevent further flying before repairs had been executed.

Upon detailed investigation it became apparent that the most prevalent cause of minor accidents was the deck gear itself. Fore and aft wires were therefore abandoned.

This assisted in the improvement of the design of fleet aircraft since they were no longer hampered by all the extras, entailed by using the fore and aft wires, which increased weight and head resistance. A plain deck was also a step towards making the conditions for landing more nearly resemble those of an aërodrome. The problem of deck landing now resolves itself into alighting on the center line of the ship and keeping on it. If for any reason a pilot finds —he is off this line he must at least keep parallel to it for to swing off will put the aircraft across the high relative wind, and there will be the inevitable tendency to drop one wing, increasing the swing until the aircraft runs over the side. So long as the aircraft has considerable way on, it is not difficult to keep it straight, and the modern addition of independently operated brakes has increased directional control.

Whereas a few years ago there were a number of accidents, today under all conditions about 99 per cent of the landings are quite successful.

Railway and Aircraft Competition

N. W. Ayer and Sons, February.—The nation's railroads, instead of resorting to ruinous competition with air transportation routes, should seize upon this facility as a new transportation medium, according to W. B. Mayo, head of the airplane division of the Ford Motor Company.

His statement was prompted by recent published reports to the effect that the principal rail lines were considering reduction of rail rates as a means of combating competition of air transport routes and motor bus lines, to which the railroads have been steadily losing passenger traffic. Mr. Mayo said:

Recent reports to the effect that the railroads are planning to meet the serious competition for passenger traffic of the air transport lines and other services by reducing passenger fares to two cents, would indicate that railroad officials have failed to recognize

the lesson that transportation history during the last fifty years should have taught.

The railroads are engaged in the business of furnishing a transportation service and should utilize every vehicle at their command to properly furnish this service. Railroad officials have recognized recently that every means at their command should be utilized to prevent the further loss of passenger traffic, yet they appear to have failed to recognize that the simplest solution of the problem is to merge the competing transportation services into their own systems.

The condition which confronts the railroads today, is similar to that which faced them nearly fifty years ago when the "interurban electric lines began their serious drain upon the railroad passenger traffic.

Then the railroads failed to heed the warning and failed to meet the competition of the electric lines by electrifying their own suburban and interurban lines and furnishing the same frequent service which the electric lines were able to offer. As a result the railroads lost a tremendous amount of local and interurban passenger business, which they might have retained had their executives been farseeing enough.

Today the motor bus has killed off most of the interurban electric lines and is proving an even more serious competitor of the railroad not only for short-haul interurban traffic but also for long-haul and even transcontinental traffic. The railroads are meeting this threat to their passenger business in different fashion. Railroads are now recognizing the motor bus has a field of its own in furnishing cheap, frequent transportation service. At least one great railroad is reported to be heavily interested in one of the largest intercity motor bus corporations.

The next most serious threat to the railroad's passenger business is now being provided by the growing network of scheduled air transportation routes, which are now still in their infancy and yet are offering the traveler the fastest service provided by a transportation facility and taking a growing toll from the railroad's de luxe traffic.

Air lines are transporting travelers between cities or across the continent in a fraction of the time required by the fastest trains.

The growing traffic with which they are being favored is taken directly from the de luxe traffic of the railroads—the passengers who travel in limited trains and are able to buy the best accommodations. The railroads cannot afford to lose this traffic.

Thus far the railroads have attempted to combat this new threat by speeding up their schedules and providing the utmost in luxurious comfort on their fastest trains. But this, it appears, will not accomplish the purpose. The fastest train schedules possible with the present form of equipment are slower than a transport airplane can travel. Speeds scheduled on the air lines are approximately twice and sometimes three times those of the fastest limiteds.

Furthermore, it must be remembered that the speed of the airplane will probably be doubled during the life of the present generation, while the speed of railroad trains appears to have nearly reached its safe maximum. It is apparent, therefore, that the railroad cannot compete with the airplane in speed. Moreover, the airplane will soon be able to hold its own in the luxury and comfort it offers to travelers.

Reasoning in this fashion, we must admit that the railroads are facing a serious problem. Yet it is a problem easy of solution, if railroad executives can be convinced of the wisdom of taking advantage of this new, faster, luxurious vehicle to offer to their patrons a new de luxe form of transportation.

It must be remembered that the de luxe railroad trains are the most costly service provided and that they tend to slow up the movement of freight, the most highly profitable traffic the railroads enjoy.

The types of service which the railroads could offer with aërial passenger equipment are manifold. Already air lines are complementing fast rail service by putting the Middle West and Mississippi Valley cities within a day's travel of the Atlantic or Pacific coasts. Air lines may also be used to tie together the rail lines which parallel each other through the western states, or to furnish side trips to such points of interest as the Grand Canyon, the Yellowstone, and other national parks, and other points difficult of access or so situated that rail construction to provide service to them would be too costly under the present potential volume of traffic to them.

There appears to be no question of the utility of the airplane. It needs only to be

placed in the proper hands to enable it to demonstrate its ultimate usefulness, and the railroads would seem to be the proper agency to capitalize its value. Their executives are skilled in the science of transportation. Their systems have the ground facilities already in existence. There is no reason the railroad ticket seller cannot sell tickets for plane lines. The railroads have the operating personnel with the exception of the pilots themselves. In fact, they are ready today to add the operation of air transport lines to their other transportation services.

The rail executives must remember, too, that the airplane is the fastest transportation vehicle yet developed, and that it will succeed, as has every other vehicle which has proved itself faster than its predecessor. Witness the stage coach, the canal boat, the railroad, the electric interurban train, the motor bus, and now the plane.

It would appear, therefore, that the railroads are not only the proper agency to take upon themselves the operation of air transport lines as one form of the transportation service they offer to the public, but that such a move on their part is good business. It is to be hoped that railroad executives can be convinced of this fact so that the air lines may be added to the other transportation services of the railroads.

If not, then, as I see it, another entirely new set of business men will, of necessity, be educated in this new form of transportation, all of which will slow down slightly the present rate of advance in the development of air transportation, but will surely mean greater acceleration in this development in the near future.

ENGINEERING

Navy Weaves Radio Net Across Land and Sea

New York *Times*, February 15.—Despite the popular emphasis on broadcasting and its 600-odd stations scattered throughout the country, the greatest field of radio, so far as the number of stations is concerned, is in the field of communication. The United States Navy, a pioneer in the development of the wireless science, has the largest single radio organization in existence. Its 400 stations, ashore and afloat, rival the broadcasting networks in size and scope.

There are 121 naval shore stations in active operation daily, including fifty radio-compass units providing twenty-four hours' service to ships on the high seas and to aircraft in the determination of their bearings. Afloat there are some 275 navy vessels, all equipped with radio apparatus. These figures do not take into account the numerous naval planes carrying radio instruments.

The traffic and compass stations are scattered along the coast of continental United States, Alaska, the West Indies, Hawaii, Samoa, Guam, the Philippine Islands, and Panama.

Approximately $3,000,000 is expended annually in maintaining this huge network of communication facilities both on the fleet and ashore. By means of this system the administrative heads of the government in Washington are linked with all naval districts and possessions and with American ships throughout the world.

Since 1900, when the Navy Department made its first radio installation with equipment purchased abroad, such progress has been made that the navy is now almost wholly dependent upon radio not only for its communication but for the maneuvering of its fleet.

Marked progress in the development of radio has been noted since the World War. Before this naval vessels carried one or two transmitters of the "spark" or "arc" type, emitting what are known as damped waves. These emissions were broad and conducive to the creation of interference. The apparatus was cumbersome and required high power for the coverage of even short distances.

With the war came the development of the vacuum-tube transmitter and the use of short waves, which permitted the building of much less complicated apparatus and the use of less power. Consequently, instead of just one or two transmitters, the larger vessels now carry multiple transmitter installations, allowing operation on the various bands reserved by presidential mandate for naval communication.

Approximately 65 officers and 897 enlisted radio operators are employed in naval communication work ashore. Besides keeping contacts with naval units afloat, these operations provide communication service for nearly every government department. Traffic handled during the fiscal year 1928-29 by these shore stations amounted to more

than 3,500,000 messages. In the same year Navy compass stations furnished more than 250,000 bearings, the majority being to merchant vessels.

All Navy ships and some shore stations are open to commercial communications in times of emergency or when privately owned commercial stations do not exist or are inadequate.

To insure communication with insular possessions and with American ships at sea in any part of the world, a chain of long-distance radio stations is maintained in the United States and in outlying territories. By means of a prescribed plan these stations communicate directly with other long-distance stations, which, in turn, contact with district communication centers, which either by radio, telegraph, or telephone can communicate with ships, other district centers or the Navy Department.

One of the most important adjuncts of the communication division of the Navy is the Naval Research Laboratory, at Bellevue, D.C., where most of the radio experiments are evolved. Several developments of a sensational nature are now being conducted secretly. Within a short while it may be possible to pilot a naval battleship and to fire its guns from a distance by radio.

Television is being thoroughly investigated with the view of applying it for both peacetime communication purposes and for warfare.

Fog Warnings at Sea

Engineering, January 16.—In an official notice which was issued to mariners on Saturday of last week, January 10, the trustees of the Clyde lighthouses gave instructions with regard to the working of the new talking beacon which has been installed at the Little Cumbrae lighthouse on the Clyde, and which in future will be in operation during foggy weather. The apparatus has been invented by Mr. Charles A. Stevenson, M. Inst. C.E., of Edinburgh, and his son, Mr. D. Alan Stevenson. It consists essentially of a radio gramophone which works in conjunction with the lighthouse fog signal. The principle of the system is that while wireless waves are carried to practically all distances simultaneously, sound takes an appreciable time to travel to the ear of the observer. The function of the stop watch is taken by the gramophone record, which counts out in speech the distance from the beacon in cables and sea miles. The exact distance of the ship from the beacon is that which the observer hears spoken on the wireless at the moment the sound at the end of the third blast of the fog signal reaches him through the air. The mariner hears through the air a repetition every seventy seconds of the fog signal, consisting of three blasts, then silence, followed by two blasts and again silence. On the wireless receiver there is repeated at 70-second intervals the name of the beacon in speech, "Cumbrae," then three blasts of the fog signal, followed by speech counting in cables and sea miles up to five miles; then two blasts of the fog signal and about twenty-seven seconds of silence until the name "Cumbrae" is again spoken. The beacon transmits on a wave length of 1044 mm. at a power of about 40 watts. The Anchor liners and coasting steamers have used the apparatus for some time past and have found that very accurate results are given. It seems likely that the system will be widely used for signally in fog at sea.

Conductivity Meters and Their History

Marine Age, February 15.—By W. H. Gates.—The increasing use of water-tube boilers and the tendency towards higher steam pressures have made the question of the purity of feed water a most vital one. This is true for both land and marine power plants. The past ten years have seen great strides made in the development of internal-combustion engines, which has naturally reacted on steam engineering with an impetus to create new development and research work in that field.

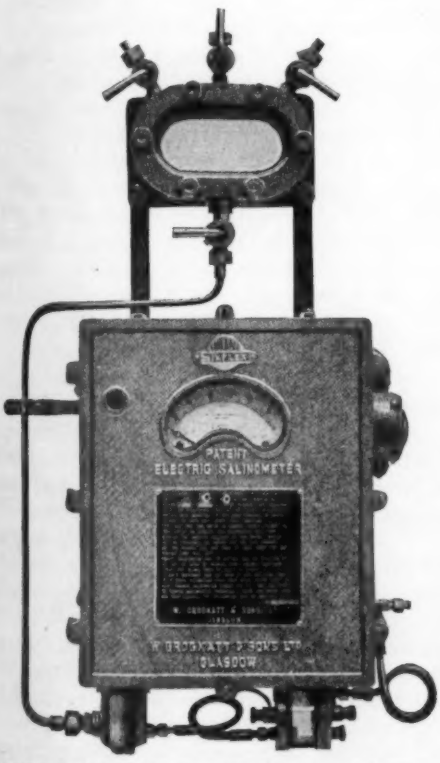
The results of these developments we may see in the use of high-pressure water-tube boilers, using economizers or superheaters to obtain a greater degree of superheat and increase efficiency. This calls for high rates of evaporation and accentuates the dangers resulting from soluble impurities in the boiler or feed water.

Formerly, the condition of the water was checked after it was in the boiler, by drawing water from the salinometer cock and testing its specific gravity with a hydrometer, but with the development of steam plants, it soon became necessary to know the condition of the water before it enters the boiler. Then with the advent of the water-tube

boiler and higher pressures, a real emergency arose for more suitable means of testing, which must be automatic, assure continuous operation, reliability, simplicity, and ability to withstand ordinary engine-room use.

The most efficient way to meet these requirements has been found in the use of electricity. This method uses the ability of a liquid to regulate the flow of electric current through it, in a definite relation to the specific gravity or concentration of the solution.

This principle was first adopted and patented by a Scotchman named William Camble Crockatt, B.S.C., of Glasgow. For many years this principle in its simplest form consisted of using a cell through which a small quantity of the feed water was bypassed. The water came in contact with two electrodes, which in turn were connected to a D.C. electric supply, and through an ammeter. The density of the water acts as a resistance, any variation is recorded on the ammeter and by calculation the relative density of the water was determined. The next step was to calibrate the ammeter in grains per gallon, and in this form the meter served its purpose for many years with the old-type Scotch boilers.



MODERN ADMIRALTY PATTERN INSTRUMENT

With the increased use and development of water-tube boilers, the question of temperature variation became more important and made necessary its consideration and the making of compensation calculations and charts.

In the past two years, steps were taken to overcome the shortcomings of the instrument on hand, there being felt a real need for a more accurate and serviceable instrument which would meet modern requirements. In this connection, credit is due Mr. W. W. Smith, chief engineer of the Federal Shipbuilding Corporation and his staff, for the patience and time they expended in developing an instrument whereby the solution being tested is passed through a cooler to bring the temperature within specific limits so that charts could be made showing curves from which the density of the solution could be arrived at without resorting to mathematical calculations.

Since the original patent was granted, the inventor never lost sight of the development and requirements of modern steam engineering, and his present-day machine, which is built on the ammeter principle, has automatic temperature control. This eliminates the necessity of a cooler with its juggling of valves and attending possibilities of leakage of the cooling medium (usually salt water) into the instrument feed line. It also does away with the necessity of charts which are apt to become damaged or lost and reduces the effort of the engine-room staff and chances of error to a minimum.

Now, it is only necessary to glance at the meter which tells the story continuously before the water enters and when the feed water reaches the dangerous stage, the warning lamp is lighted and a gong sounded to attract attention.

In the multiple cell type, the location of trouble is instantly shown as it occurs, by the lighting of a lamp connected with that particular circuit. The modern instrument is exceedingly sensitive, in fact the type used by the British Admiralty is calibrated to read from 0 to .5 grains of chlorine per gallon, but for ordinary marine and power station work, the usual scale is from 0 to 5 grains of salt per gallon.

NOTES ON INTERNATIONAL AFFAIRS

From February 4 to March 3

Prepared by Professor Allan Westcott, U. S. Naval Academy

UNITED STATES AND LATIN AMERICA

Our Latin-American Policy.—On February 6 Secretary of State Henry L. Stimson, speaking before the Council of Foreign Relations in New York, set forth an interesting explanation of the present administration's policy toward the other republics of the new world, and especially of its policy in recognizing governments established by revolution. The opening of the speech was devoted to praise of the Monroe Doctrine, which the Secretary declared "in its general conception a noble one," and which "far from being an assertion of suzerainty over our sister-republics, was an assertion of their individual rights as independent nations." He called attention also to the fact that in the past seven years American good offices have resulted in settlement of eight boundary disputes among eleven countries of this hemisphere.

Passing to our recognition policy, he declared that in general, as regards South American states, our present policy is the one that has been followed since the days of Jefferson, that is, of basing recognition not upon the question of constitutional legitimacy but upon a new government's "*de facto* capacity to fulfill its obligations as a member of the family of nations." This calls for (1) control of governmental machinery, (2) general acquiescence of its people, and (3) ability and willingness to discharge international obligations.

As regards the five republics of Central America—Guatemala, Honduras, Salvador, Nicaragua, and Costa Rica—these countries made an agreement among themselves in 1907 providing that each of the contracting parties would refuse to recognize a government created by coup d'état or revolution until constitutionally established by a freely elected representative body, and in 1923 they extended this by an agreement not to recognize a revolutionary government, even when constitutionally organized, if the president were a former revolutionary leader, relative of a leader, or prominent in the revolutionary movement. The United States, though not a party to this agreement, stated that it would base its policy toward the five republics on the same principle, and has since adhered to it, according to Secretary Stimson, with happy results.

In the matter of governmental prohibition of traffic in arms between American firms and revolutionary movements not recognized as belligerents, the Secretary found this easy to justify under international law and under the Treaty of 1928 between the United States and the twenty Latin-American republics.

Aircraft Restricted at Panama.—The U. S. Senate in February ratified the pan-American convention on commercial aviation, signed at Havana in 1928 and already ratified by Panama, Mexico, Guatemala, and Nicaragua, which while giving in general free passage to aircraft over territories of the contracting parties, leaves any nation, or any two nations by agreement, the right to prohibit flights in definitely limited areas, no distinction being made in this respect between its own commercial aircraft and those of other powers. Under the convention it will thus still be possible to retain restricted

zones near the defenses of the Panama Canal.

MARINES TO QUIT NICARAGUA.—As announced by the U. S. State Department on February 13, about half of the U. S. marines now in Nicaragua will be withdrawn by next June, and the remainder after the presidential elections in 1932. To make the execution of this program possible, the strength of the Nicaraguan National Guard will be increased correspondingly and its training pushed more rapidly.

PERUVIAN GOVERNMENT AGAIN OVERTHROWN.—Following a brief two weeks' warfare in Peru, the government of Provisional President Sanchez Cerro set up by revolution last August was in turn overthrown and a new Junta took control at Lima with Leoncio Elias, former chief justice, as provisional president and the commander in chief of the Navy, Captain Alejandro Vinces, as a member of the ruling committee. The downfall of the Cerro government was precipitated by an ultimatum from the Navy, which called for Cerro's resignation on the threat that the naval vessels then laden with troops would go over to the rebellion.

The first of the February revolts was engineered by a few followers of ex-President Leguia at Callao, and was quickly suppressed with a loss of some sixty killed and wounded, including one American onlooker. The uprisings thereafter took on a more serious character, securing control of the city of Arequipa in southern Peru and spreading to other sections of the country. They were organized not by followers of Leguia but by adherents of the August revolution who quickly became dissatisfied by the conduct of Cerro and the Lima group which then took control. The cruiser *Bolognesi*, sent to block the southern port of Mollendo, went over to the rebels, and was soon followed by the entire squadron at Callao.

AMERICAN FOREIGN INVESTMENTS.—The February 4 issue of the *Foreign Policy Information Service* is devoted to a statistical survey of United States capital invested abroad. According to figures given, the total of American foreign investments on January 1, 1931, was seventeen and one-half billion dollars, as compared with sixteen and one-half billion a year before, and only two and one-half billion in 1914. Of this 1931 total, five and one-half billion is invested in Europe, four and one-half in Canada, three in South America, slightly under three in Central America and the West Indies, and the rest chiefly in Australasia and the Far East.

The total war debt due the United States government, and not included in the figures above, amounted on January 1, 1931, to $11,610,000,000, with a present value of $6,862,000,000. The payments to January 1 amount to $2,515,000,000.

EUROPEAN CONFERENCES

FRANCO-ITALIAN NAVAL SETTLEMENT.—The desperate efforts of Great Britain to bring about a naval settlement between Italy and France, not only as a means of curbing her own naval expenditures but in order to remove a situation which promised ruin to the general disarmament conference of 1932, was at last crowned with success when news of an accord was announced from Paris on February 28. To attain this result had required months of effort on the part of Sir Robert Craigie, British naval expert, in consultation with naval representatives at Paris and Rome, supplemented at the end by a hurried visit to Paris on the part of Foreign Minister Henderson and First Lord of the Admiralty Alexander, and a journey thence to Rome and back to Paris.

The agreement, it is understood, will remove the danger of naval rivalry between the two countries until 1936 and limit them to a building program during these years within the requirements of the London treaty. While the terms of the agreement were temporarily withheld, it was understood that the Italian demand for parity was entirely avoided, while the total French tonnage in 1936 will be in the neighborhood of 150,000 tons above that of Italy, instead of the 244,000 tons superiority called for at London. As a concession to England the French submarine tonnage for 1936 will be not more than 85,000 tons.

RUSSIA TO JOIN PAN-EUROPA MOVEMENT.—The decision of the European nations to include the Soviet Republic in their efforts to form a European federation was put into effect early in February when an invitation was sent to Moscow, through the

League Secretariat, requesting the participation of the Soviet government in the second pan-European conference to be held at Geneva in May. No conditions were set, and it was considered certain that Moscow would accept, while seizing the opportunity for remarks on federations, international disarmament, and allied themes.

GRAIN CONFERENCE IN PARIS.—In hope of finding a sound basis for his pan-European movement in some preliminary step of economic coöperation, Foreign Minister Briand was chiefly instrumental in arranging for the European Grain Conference which held its sessions in Paris during the last week of February. The purpose of the conference was to form some plan of concerted action for disposing of the huge grain surplus of the five chief grain-producing countries of eastern Europe—Poland, Rumania, Hungary, Bulgaria, and Jugoslavia. Of the grain-importing countries, however, England could make no promises because of her obligations to her colonies, and the grain yield in France is expected to exceed requirements. Furthermore, little beyond pious good wishes could be expected from European grain-purchasing nations with the prospect before them of supplying their needs at lower prices from Russian and American sources. Between August and February the Soviet government exported 85,000,000 bushels of wheat to the European market, as compared with 2,000,000 bushels in the same period last year. And at the very period of the conference came the disconcerting news that the U. S. Farm Board was planning to throw 35,000,000 bushels of wheat into the continental markets at prices considerably below those at home.

In these circumstances the only hope of remedy appeared to lie in a world agreement limiting prices and possibly curbing production, or at least an agreement including all the chief grain-producing countries except Russia. A second conference was arranged to meet at Rome on March 26, to which the United States, Canada, and Argentina will be asked to send delegations.

FRANCE

FRENCH FOREIGN POLICY.—An Italian analysis of the present-day foreign policy of France is given by Renzo Sereno, Italian historian and publicist, in the *Rassegna Italiana* of Rome, excerpts from which appear in the January *International Digest*. M. Sereno finds the key to all French policy of today in the formula of mercantilism—the self-sufficient state which has within itself all sources of life and wealth, with an army adequate to protect its sovereignty and guard its frontiers and a fleet sufficient to protect its coasts and insure free communication with the colonies.

Where her naval policy is concerned, France has already put her cards on the table. The naval tonnage that France desires is established in proportion to the necessity for her of a closed market. This tonnage, therefore, bears a relation not only to her coast line but also to her colonial empire, whose approaches must remain open. In a possible rivalry with Italy, her direct competitor in the Mediterranean, France is sure of victory by her economic capacity alone. And while she is always at the head of every anti-war movement, she has not cared to solve definitely the problem of disarmament as her principal efforts are directed toward the preservation of the *status quo*.

France is today intransigeant with regard to the revision of the peace treaties; a question which agitates the whole of Europe and which is very apt to press with a heavy weight upon the domestic politics of every country. As a matter of fact, the maintenance of the *status quo* is necessary for France to preserve her continental primacy. She therefore tries to substitute for treaty revision a pan-European body which would tend to shackle all nations to their present condition, thus inhibiting the reappearance of a military adversary or the increase in power of the nations revolving in her political orbit. A treaty revision would mean a retraction of the mercantilistic principle that inspired peace, a peace which, irremediably disarming and mutilating the anti-French powers, has put France into a position where she need not be afraid of any competitor.

Having attained this position of security, France excogitated the pan-European system. This possibility of uniting the European countries into a federation would, for France, signify the possibility of absorbing directly the production of those states whose pole she is. In this manner, for instance, the old European metallurgic cartel would become effective and capable of arresting American expansion. But the anti-American significance of pan-Europe is secondary. In the foreground reappears the old mercantilistic principle of the state as an economic whole, tending to shelter to its own advantage all productive enterprises.

SPAIN

MONARCHY SURVIVES CRISIS.—The struggle for governmental changes in Spain, now almost the last stronghold of genuine monarchic rule in Europe, went through another phase during February, when the courage and political astuteness of King Alfonso

again succeeded in postponing steps toward constitutional reform. Early in the month it appeared certain that regular elections would be held in March. A decree was issued restoring constitutional guarantees, lifting press censorship, and setting March 1 and March 15 as dates for the first regular parliamentary elections to be held in Spain in seven years. It soon became evident, however, that the Republican and other radical parties would refuse to participate in these elections, and that the more liberal Monarchist parties would also decline to take part, unless the elections were clearly recognized as simply a preliminary step toward the calling of a constituent Cortes, for revision of the constitution. The Berenguer ministry thereupon resigned, and for a few days the fate of the monarchy hung in the balance. Under threats of a general strike which would have "rocked the country to its foundations," the King flirted with the idea of giving in to the radical demands and accepting a cabinet under the Republican leader Sanchez Guerra. On February 18 came another sudden about-face when Alfonso rescinded his call to Guerra, and with guns of loyal troops trained on the capital city gathered together a cabinet of Monarchists under the nominal leadership of Admiral Juan Aznar, veteran of the Spanish-American War and now in his seventy-first year. The new cabinet's policy was defined as return to "normalcy," with postponement of parliamentary elections for several months and steps thereafter toward constitutional changes on a limited scale. What the next step of the left parties would be remained uncertain, but with the weapon of a general strike in their hands and the bulk of political sentiment in favor of an overhauling of the whole governmental system, a new crisis may be precipitated at any time.

GREAT BRITAIN AND COMMONWEALTHS

CONFERENCES WITH GANDHI.—Interest in the Indian problem centered chiefly during February in the meetings between the Viceroy, Lord Irwin, and Mahatma Gandhi, though in these conversations the question of relatively unimportant concessions to the Nationalists appeared to take precedence in the mind of Gandhi over the larger question as to whether the Nationalists would consider the proposals of the London conference. The meetings were held at the direct request of Gandhi, began on February 17-18, and were renewed at the close of the month, the Mahatma having in the meantime been granted full power to negotiate by the Indian Congress Working Committee. The Viceroy indicated willingness to concede most of the opposition demands, including amnesty of political prisoners, withdrawal of restrictions on the Congress party's activities, and investigation of any definite charges of police brutality, but pointed out that other demands, such as withdrawal of the salt tax, could be carried out only by ordinary legislative methods, and the right of boycotting English goods could not be conceded. While there was much pessimism as to the outcome of the negotiations, Gandhi was said to be more open to reason and to consider practical politics, and also subject to strong pressure from moderate and at the same time influential elements within his party.

PALESTINE POLICY MODIFIED.—Attempting the difficult feat of sitting between two stools, Premier MacDonald laid before Parliament on February 13 a letter which he had sent to Dr. Chaim Weizmann, former president of the World Zionist Organization, in which he sought to make the Passfield White Paper of last October more palatable to the Jews without renewing the hostility of the Palestinian Arabs. According to the letter, immigration of Jews will be restored to the old basis of "the absorptive capacity of the country" instead of conditions of Arab and Jewish unemployment; Jews will be employed on public works in proportion to Jewish contributions to public revenues rather than on the basis of population; and restrictions on land purchases are also virtually removed by a new interpretation of "landless Arabs" to include only those who were formerly cultivators of land.

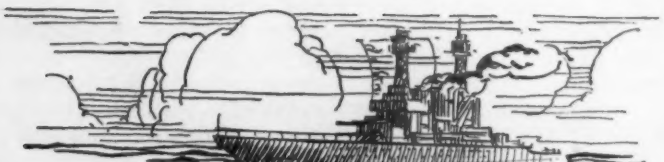
IRAQ OIL CONFLICT THREATENED.—On the eve of the ratification of the new Anglo-Iraquian Treaty by which England practically releases her mandate over Iraq, came reports of renewed conflicts between England and France over the route of the proposed pipe line by which the vast oil resources of the Iraq region will be brought to the Mediterranean. The Iraq Petrol

Corporation, in which French, British, American, and Armenian interests have joint shares, has negotiated for one outlet through the French mandate of Syria to the port of Tripoli, and another through the British mandate of Palestine to Acre. France, however, is said to oppose the branch line to Acre as greatly increasing the cost, and is also opposed to the scheme of defending the pipe line by a parallel railway, which is regarded as a device on the part of the British for securing a new rail route to the East.

FAR EAST

PROPOSED LOAN TO CHINA.—A subcommittee of the United States Senate Committee on Foreign Relations on February 11 recommended to the favorable consideration of the full committee two draft resolutions relating to the stabilization of silver prices and a silver loan to China, as a means of relieving the world economic depression and reviving world trade. The first resolution proposed that the President should be asked to open negotiations with other governments "looking to the supervision of the policy and practice of governments melting up or debasing silver coin and sales by governments of silver. . . ." In the report accompanying the resolution it was claimed that the melting up and sale of silver coin by the British government in India has been partly responsible for the tremendous drop in silver values. This resolution was favorably acted upon by the full committee.

The second resolution proposed the creation of a silver pool by governments having important trade relations with China, from which the Chinese Nationalist government could obtain loans for coinage. The expenditure of such loans would be restricted to road building and similar public improvements, which, according to the theory behind the resolution, would tend to stop civil warfare by providing employment, improve economic conditions, and build up a Chinese market for foreign goods.



BOOK REVIEWS

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THE REMINISCENCES OF A MARINE. By Major General John A. Lejeune, U. S. Marine Corps. Philadelphia; Dorrance and Company, 488 pages. 1929. $4.00.

REVIEWED BY BRIGADIER GENERAL DION WILLIAMS, U. S. MARINE CORPS

For the accomplishment of the task which he set for himself in writing the *Reminiscences of a Marine* General Lejeune drew liberally upon the stores of memory of a busy life replete with varied service at home and abroad, afloat and ashore, and the result is a book of surpassing interest to the soldier and the civilian alike.

A believer in the theory of hereditary influence, he begins his work with an outline of his ancestry in their long journey from the homeland in France to the new land of promise in Nova Scotia, the Arcadia from which they were to be driven by cruel politics in which they had no voice to another far land to the south, the Louisiana which was to be their home until adventure again called and took the son of the family to Annapolis and started him upon the career which this book so well describes.

The picture of his four years at the Naval Academy contains an excellent description of the life there in the days of the "old academy," a simpler life than that of the midshipman of today, but withal a life more exacting and probably as well designed to fit its participants for the later experiences as officers in the naval service as the more complicated and less directly supervised life at the great modern institution.

Another chapter tells of his experiences on the "two years' cruise" as a midshipman, which in those days formed an important part of the course designed to fit the aspirants for naval commissions for their future duties. In an old wooden ship, the U.S.S. *Vandalia,* even then a relic of a former naval period, he, with other members of his class, saw service in the Pacific South Sea Islands which took them through the "Samoa Disaster" of 1889, a hurricane which strewed the reef-lined shore of Apia with the wrecks of three United States warships and three German men-of-war and cost many lives. The story of this debacle, which had such a sudden and vital effect upon the diplomatic tangle between Great Britain, Germany, and the United States, is one of the most readable stories of the many to be found in General Lejeune's book, and the student of world history will find it well worth careful perusal.

The two years' cruise over, the story takes the writer back to the Naval Academy for final examination and commission at the end of which we find the author fairly started on the career that was to make him famous as an officer of the U. S. Marine Corps. His early barracks service ashore is next described followed by incidents of a cruise to South America in the U.S.S. *Bennington,* one of the new steel cruisers of the famous "White Squadron" of the early nineties which marked the beginning of the return of the American Navy to an honorable position among the navies of the world.

EDITOR'S NOTE: Published by courtesy of the *Marine Corps Gazette.*

Active participation afloat in the Caribbean campaigns of the Spanish-American War; a command ashore on the Isthmus of Panama when we took over the Canal Zone in 1903 and started the work on the great canal; command of the Marine Brigade which landed at Vera Cruz in 1914; command of the Marine Brigade in the Philippines; and varied shore duty in the United States, are next portrayed in attractive language and interesting continuity.

But all of this is but the forerunner, the picturesque background in the life of General Lejeune before which is pictured the stirring story of his participation in the World War as the leader of the famous Second Division of the A.E.F., than which there was no greater organization in the vast allied crusade which forced back the rising tide of Germanic power which would have crushed for the time in the history of the world the cause of free government "of the people, for the people, and by the people."

That portion of the *Reminiscences of a Marine* which treats of the the experiences of the author in the World War forms an authoritative history of the participation of the U. S. marines in the front line fighting on the Western front and the battles at Marbache, St. Mihiel, Blanc Mont Ridge, and the Meuse-Argonne, followed by the triumphal march to the Rhine and the American occupation of one of the zones of occupied German territory on the Rhine.

The book closes with brief mention of nine years as Major General Commandant of the Marine Corps, during which term of office General Lejeune's great experience, tactful dealing with the other officials of the government, and wise counsel did much which will be to the lasting benefit of his corps and his country; and of his retirement from active service at his own request after forty-six years' service to take up further important military duty as the Superintendent of the Virginia Military Institute.

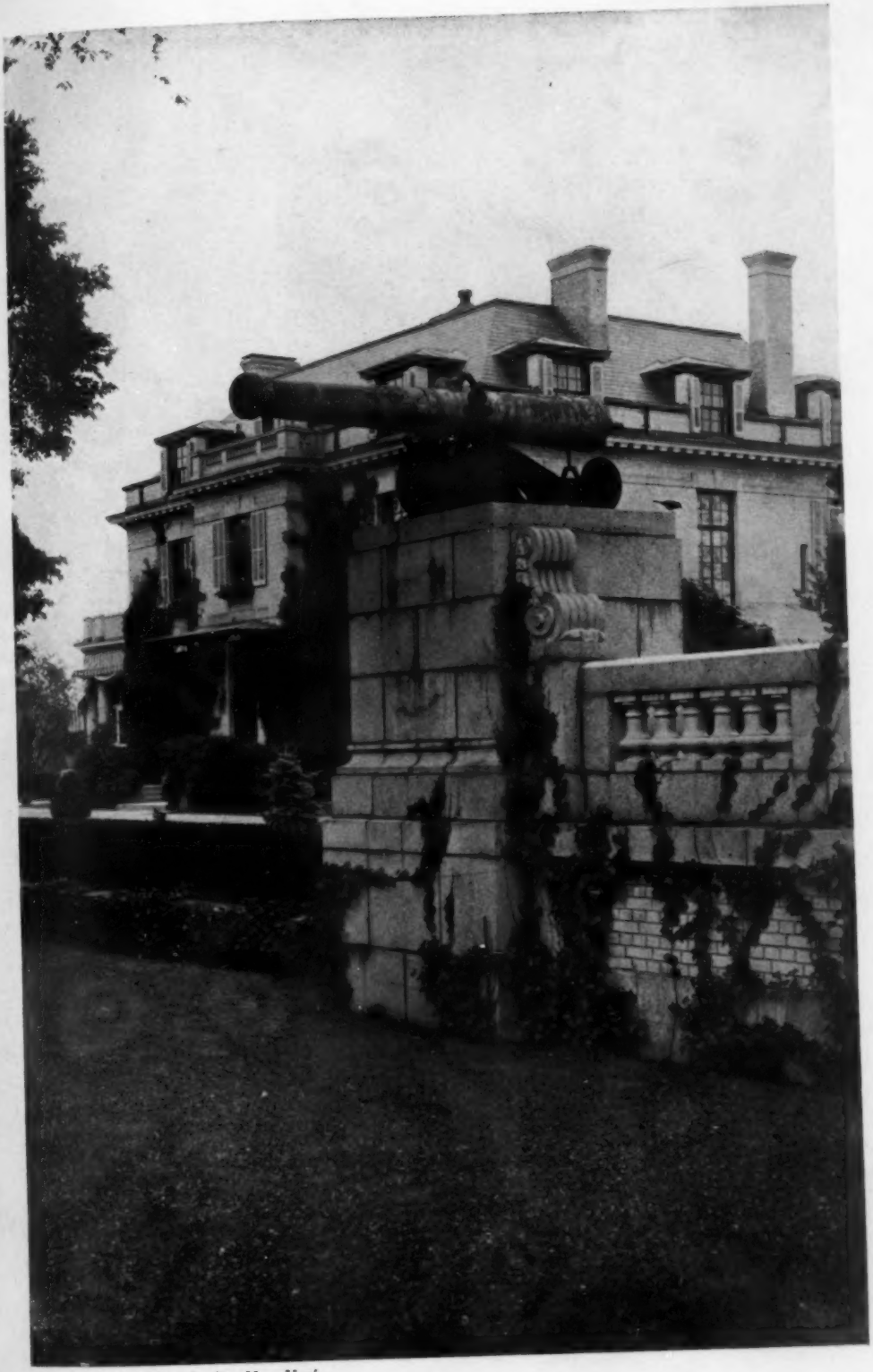
The book is a great story of a great man, told in simple and straightforward manner, with flashes of the keen humor which has ever made it a pleasure to serve under his command, and with no vainglorious boasting of his wonderful achievements in nearly half a century with the colors at the head of America's sea-soldiers, at home and abroad, on land and sea, wherever the call of our country has led in peace and war.

In the semiofficial journal of the Marine Corps, the *Gazette*, it seems almost superfluous to say that it should be both a duty and a pleasure for every officer of the great corps to read the *Reminiscences of a Marine*, for he has been a real marine and his experience has been truly wonderful.

In book reviews as they customarily appear in the better class of American magazines it has become the habit of professional reviewers to add their sketchy opinions of the subject matter of the book reviewed some general estimate of the character and ability of the author.

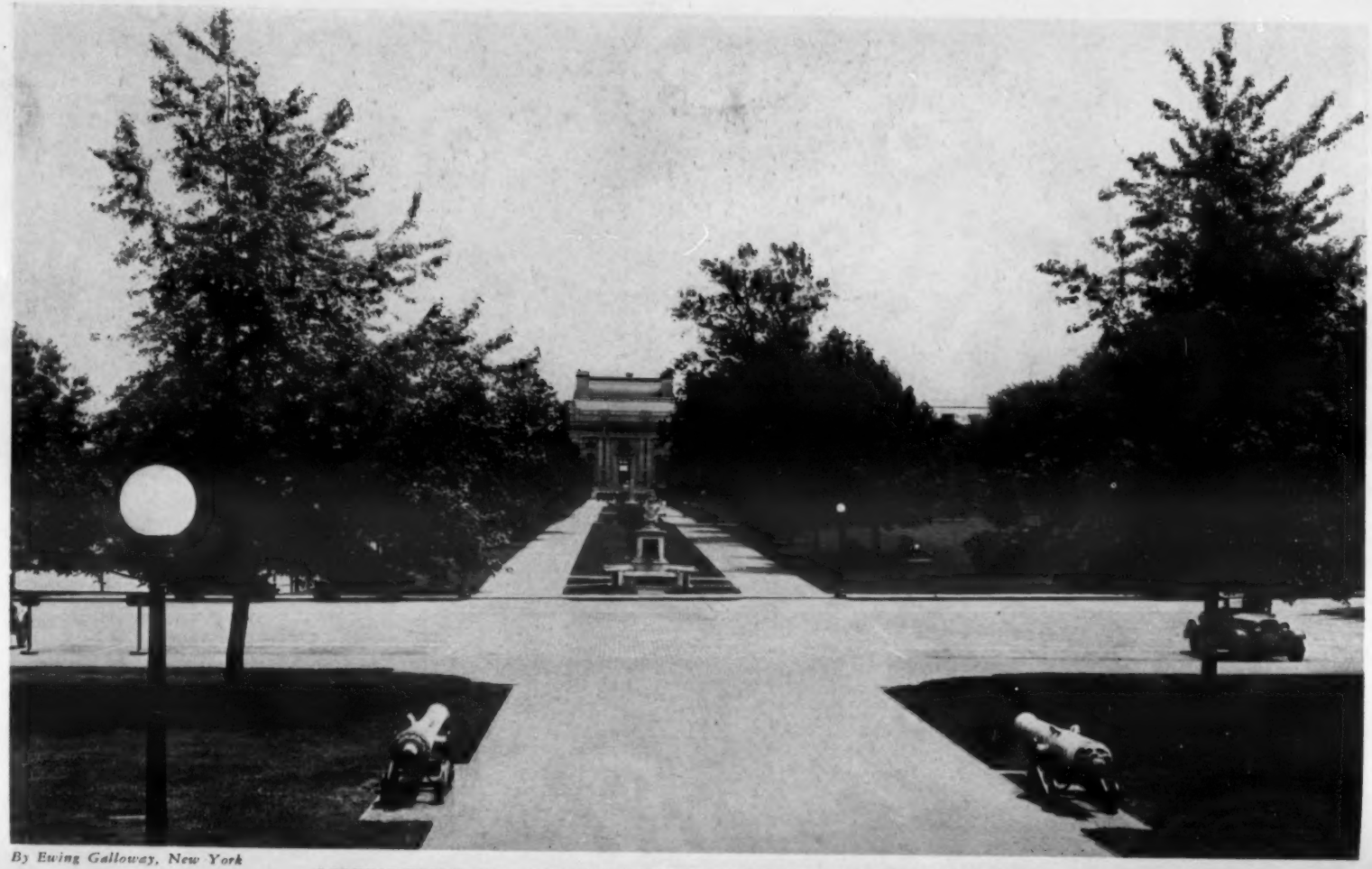
In the present instance this can be done by quoting from General Lejeune's book the graceful dedication which follows the title page in which he states that his book is, "Dedicated to the officers and enlisted men of the Marine Corps, the Navy and the Army, with whom I have served. Devotion to duty, unswerving loyalty, fine courage, and unselfish patriotism have been their dominant characteristics." Surely no soldier of any time has ever exemplified these qualities to a higher degree than has General Lejeune during the forty-seven years that have elapsed since he journeyed from his boyhood home in Louisiana to Annapolis to don the uniform of his country, which he has proudly worn ever since with such eminent success and high credit.

When he retired from active service at his own request after forty-six years' service it was not to seek a well-earned rest beneath the laurels he had won on many fields, but it was to take up more work as the head of a famous military college upon whose rolls are borne the names of many gallant soldiers and in such a position to let his own life and counsel be a living inspiration to many young men starting in on their careers. As he himself aptly put it when he said, "I do not feel that I have really retired but only that I have moved my headquarters and taken up another command," his work still continues and hale and hearty and full of life and courage he still faces the front, loyal to the traditions of his great corps and ever true to its motto, *Semper Fidelis.*



Photograph by White Studio, New York

THE SUPERINTENDENT'S QUARTERS, NAVAL ACADEMY



By Ewing Galloway, New York

LOOKING DOWN STRIBLING WALK TOWARDS BANCROFT HALL FROM MAHAN HALL

By Ewing Galloway, New York

LOOKING DOWN STRIBLING WALK TOWARDS BANCROFT HALL FROM MAHAN HALL

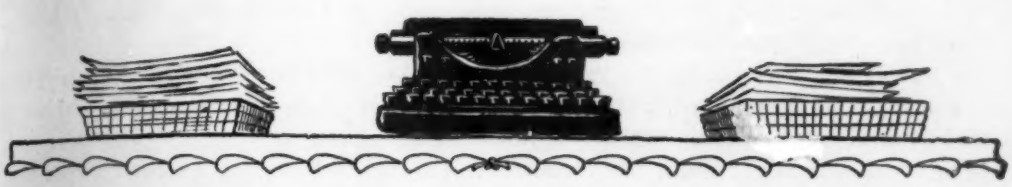
Photograph by Pickering, Annapolis

THE ADMINISTRATION BUILDING

Photograph by Pickering, Annapolis

REAR ADMIRAL S. S. ROBISON, U. S. NAVY, RETIRING PRESIDENT OF THE NAVAL INSTITUTE

SECRETARY'S NOTES



The Institute's Retiring President

Rear Admiral Samuel Shelburne Robison, who retires from the active list of the Navy in May, now has his name added to that list of eminent naval officers, headed by Admiral David Dixon Porter, which is the roster of past presidents of the Institute. Our organization was honored in having at its head a man who had achieved such a high position, not only in the naval profession, but in the scientific world as well. The assistance and the support that he has given during the past two years is more than the membership at large appreciates.

When Admiral Robison graduated from the Naval Academy in 1888 the transition from sail to steam in our Navy was not yet complete. In fact when he returned from a passed midshipman's tour of duty in China, the passage took thirty-nine days, Yokohama to San Francisco under sail, aboard the U.S.S. *Marion.*

As a young officer he served in the famous "White Squadron" on the *Boston.* From there he transferred to the *Thetis* for surveying in Lower California, and afterwards to the *Mohican* for seal patrol in the Bering Sea.

After a tour of shore duty at Mare Island, he returned to the China station on the *Boston* and served on her during the Battle of Manila Bay.

In 1899 upon returning to the United States on the *Buffalo* via Suez he attended the torpedo school at Newport before going to duty at the Philadelphia Navy Yard.

The *Atlanta,* the new battleship *Alabama,* and the new destroyer *Hull* in turn called him. His service reputation as an executive, as an administrator, and as a technical expert was constantly growing. For the next dozen years no small part of his time was devoted to technical work. From 1904 to 1906 while in charge of wireless telegraphy in the Bureau of Engineering, he prepared a manual of wireless telegraphy that was regarded as *the* authority not only in the Navy but also throughout the country. Perhaps no book in the last twenty-five years has done more to spread knowledge of radio than the nine editions of Robison's *Manual of Radio Telegraphy and Telephony.*

After a tour of duty as navigator of the *Tennessee,* and later as executive officer of the *Pennsylvania,* he returned to Washington to take charge of the electrical division of the Bureau of Engineering.

After cruising on the China station aboard the *Cincinnati,* from 1911 to 1913, he returned via Siberia to become Assistant Chief of Bureau of Engineering. He was one of the first and leading advocates of electric drive and commanded the *Jupiter* when electrical propulsion was first being tested out. On leaving that duty he assumed command of the *South Carolina.*

During the World War he performed various duties in connection with submarines and submarine devices.

Just before the close of the war he was ordered to command the Brest District, and later he was a member of the Naval Armistice Commission. After a period of shore duty that included Commandant of the Boston Navy Yard, Military Governor of Santo Domingo, and member of the General Board, he went to sea for the last time flying a four-star flag, first as Commander in Chief, Battle Fleet, and finally as Commander in Chief, United States Fleet, the highest command afloat in our Navy.

In June, 1928, after nearly two years in command of the Thirteenth Naval District and the Puget Sound Navy Yard, he became Superintendent of the Naval Academy, there to end his naval career, training others to follow in his footsteps.

For those who might doubt the advisability of an officer becoming a technical specialist, it might be well for them to review the career of Admiral Robison. He was a specialist and a noted one, but he was primarily a naval officer, and reached those heights and honors for which we all strive.

In his retirement from the presidency of the Institute, and from active service, he takes with him the best wishes of our entire membership.

The Annual Meeting

The annual meeting of the Institute was held at the Naval Academy on Thursday, February 19, 1931. Routine business was carried out. The report of the tellers showed that the following were elected as officials of the Institute for the next year:

President—Rear Admiral M. L. Bristol, U. S. Navy.

Vice-President—Rear Admiral John Halligan, U. S. Navy.

Secretary-Treasurer—Captain A. T. Church, U. S. Navy.

Directors—Brigadier General George Richards, U. S. Marine Corps; Captain Charles P. Snyder, U. S. Navy; Captain Harry A. Baldridge, U. S. Navy; Captain H. S. Howard (C.C.), U. S. Navy; Captain Wilhelm L. Friedell, U. S. Navy; Commander A. T. Beauregard, U. S. Navy.

About half of those entitled to vote sent in their ballots.

The Secretary's report, while favorable, showed that the Naval Institute had shared somewhat in the business depression that has affected the whole country. There was a gain of thirty-eight in membership. As usual, there was some loss on the PROCEEDINGS but interest on bonds and bank deposits more than covered the operating loss. The financial statement appears on the last two pages of Secretary's Notes.

The Prize-Essay Contest

This year thirty-two essays were submitted in the competition for the prize-essay award. "Elements Contributing to Aërial Superiority," by Lieutenant Franklin G. Percival, U. S. Navy (Retired), was awarded the prize. The author already holds a gold medal and life membership in the Naval Institute for winning the prize in 1929.

Honorable mention was given to Dr. Howard G. Brownson for his essay, entitled "Naval Policy in Peace and War." It is interesting to note that Dr. Brownson was awarded second honorable mention in last year's contest.

A notice in connection with next year's prize-essay contest will be published from time to time in the PROCEEDINGS.

Annual Financial Statement

UNITED STATES NAVAL INSTITUTE
ANNAPOLIS, MARYLAND

Balance Sheet
December 31, 1930

ASSETS

CASH			$ 22,797.88
ACCOUNTS RECEIVABLE			
Dues in arrears	$ 805.26		
Advertisements	2,753.69		
Book sales	1,131.76		
Accrued interest	3,274.51		7,965.22
BONDS (at cost)			179,171.59
INVENTORIES			
Institute publications	$ 41,073.69		
Purchased books	4,468.82		45,542.51
FURNITURE AND FIXTURES			1,907.73
MISCELLANEOUS			
Donation—Naval Historical Foundation	$ 1.00		
Envelopes	1.00		
Books charged off	1.00		
Photographs charged off	1.00		4.00
PREPAYMENTS			
Manuscript awaiting publication	$ 1,487.77		
Engravings awaiting publication	721.24		
Prepaid expense	319.50		2,528.51
TOTAL ASSETS			$259,917.44

LIABILITIES

ACCOUNTS PAYABLE			
Various dealers	$ 3,351.85		
Accrued royalties	655.65		
Naval Historical Foundation	125.00		$ 4,132.50
PREPAYMENTS			
Dues	$ 12,259.42		
Subscriptions	1,634.97		
Sundries	479.05		14,373.44
RESERVE FOR UNCOLLECTIBLE DUES			1,500.00
DEFERRED CREDITS			
Contingent profits			17,695.35
SURPLUS			222,216.15
		$259,917.44	$259,917.44

Statement of Profit and Loss for the Year Ended December 31, 1930

"PROCEEDINGS"			
Sales	$ 1,421.29		
Income from dues and subscriptions	23,463.74		
Income from advertisements	10,629.61		
TOTAL INCOME FROM "PROCEEDINGS"		$ 35,514.64	
Publishing cost	$ 27,641.27		
Cost of engravings	4,734.54		
Cost of frontispieces	1,901.19		
Cost of articles	4,948.81		
Prize essay awards	404.76		
TOTAL COST OF "PROCEEDINGS"		39,630.57	
LOSS ON "PROCEEDINGS" (excludes overhead)			$ 4,115.93
INSTITUTE PUBLICATIONS			
Sales		$ 46,436.26	
Inventory January 1, 1930	$ 42,278.74		
LESS: Credits to contingent, etc.	2,219.58		
	$ 40,059.16		
Purchases	23,966.05		
	$ 64,025.21		
LESS: Inventory December 31, 1930	41,073.69		
	$ 22,951.52		
Payments to authors	2,796.67		
TOTAL COST OF INSTITUTE PUBLICATIONS SOLD		25,748.19	
		$ 20,688.07	
LESS: Contingent profits		3,355.71	
GROSS PROFIT (excludes overhead)			17,332.36
PURCHASED BOOKS			
Sales		$ 7,163.87	
Inventory January 1, 1930	$ 6,485.14		
Purchases	3,506.36		
	$ 9,991.50		
LESS: Inventory December 31, 1930	4,468.82		
TOTAL COST OF PURCHASED BOOKS SOLD		5,522.68	
GROSS PROFIT (excludes overhead)			1,641.19
GROSS PROFIT FROM OPERATIONS			$ 14,857.62
OVERHEAD OPERATING EXPENSE			
Postage, express and hauling	$ 958.69		
Office expense	966.60		
Moody's Investors Service	150.00		
Salaries	14,471.90		
Board meetings	1,427.64		
Advertising	490.20		
Collection charges	16.02		
Insurance	24.83		
Depreciation (furniture and fixtures)	211.97		
Telephone and telegraph	113.81		
Auditing	200.00		
TOTAL OPERATING EXPENSE			19,031.66
			$ 4,174.04
INCOME FROM INTEREST			9,426.53
NET PROFIT			$ 5,252.49